

# Technology Review

EDITED AT THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY

APRIL 1994

\$3.75



## ALSO IN THIS ISSUE:

- ◆ GENES TO THE RESCUE ◆ TEAM INNOVATION ◆ SMART KIDS, DUMB SCHOOLS ◆
- ◆ SPRECHEN MIT DEUTCH: AN INTERVIEW AT THE PENTAGON ◆

# technology review

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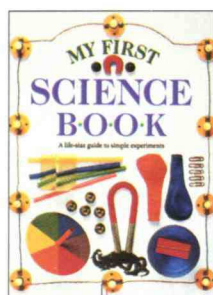
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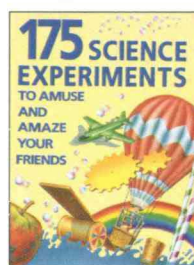


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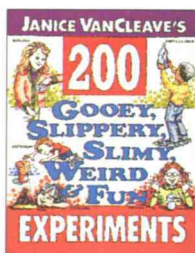
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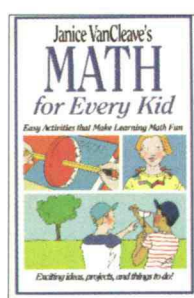


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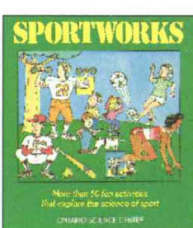


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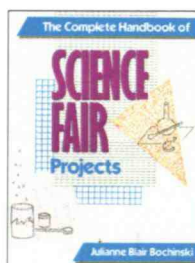


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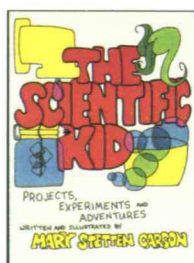


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Photographs by Sing-Si Schwartz

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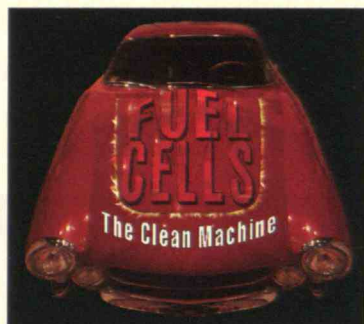






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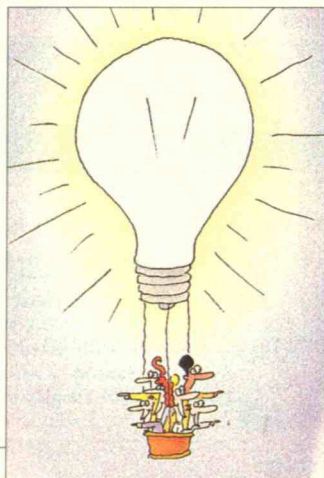
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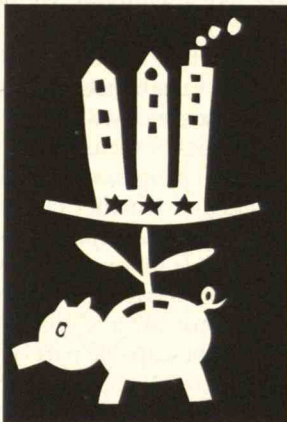
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Editorial, circulation, and advertising offices: *Technology Review*, Building W59, MIT, Cambridge, MA 02139, (617) 253-8250; FAX (617) 258-7264. Printed by Lane Press, S. Burlington, VT. Second-class postage paid at Boston, MA and additional mailing offices. Postmaster: send address changes to *Technology Review*, MIT, Building W59, Cambridge, MA 02139.

Subscriptions: \$30 per year. Canada add \$6, other foreign countries add \$12. Contact *Technology Review*, P.O. Box 489, Mount Morris, IL 61054, (800) 877-5230 or (815) 734-1116; FAX (815) 734-1127.

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Printed in U.S.A.





# First Line

## Respecting the Instrument

I recently visited the Holocaust Memorial Museum in Washington, D.C., and during the same week saw the Steven Spielberg film *Schindler's List*. The combination was quite a dose of what must surely be the most nefarious chapter in human history, and few observers can fail to be moved by the monumental suffering and destruction thus depicted, or neglect to silently resolve "never again."

This gruesome twosome had another chilling effect on me: a reinforced understanding that the Nazi death machine did not arise simply or suddenly from ignorance, perversity, or lapses in moral judgment, though all three clearly contributed. Rather, the Holocaust resulted from logical, precise, prolonged, and comprehensive policy—a tour de force of technocracy in which barbarous but dedicated administrators and staffs built a far-flung network that consistently delivered the goods.

One can surely find no better example of organizational "success" at meeting measurable goals. And it's the ultimate demonstration that technology, which includes not just applied science but a systematic way of thinking and managing, can serve good and evil equally well.

Though nothing can match the Holocaust in degree, institutionalized cruelty and the misdirected application of powerful techniques have a long history that is not limited to outright genocidal acts. More familiar to science and technology practitioners, who usually strive to do good, are some subtler sins. The risks and side effects of bold innovations, or of experiments on human "guinea pigs," have frequently met with official inattention or indifference.

Consider, for example, the 40-year-long and federally administered Tuskegee Project in which uneducated sharecroppers in Alabama were intentionally left untreated for syphilis, or the cancerous fate of numerous "downwinders" in Nevada and Utah resulting

from nuclear testing, or the large-scale sacrifice of human laborers to build the megaprojects of the Soviet Union.

And as we know from recent extensive media coverage, human subjects were methodically dosed with radiation—without their awareness or consent—in experiments sponsored by the U.S. government from the 1940s to the 1970s and conducted by scientists from some of the country's leading research institutions. Most scientists justified such work as ultimately providing benefits to

*Decent engineering  
requires an appreciation of  
"carbon-based units."*

---

society, though not all bought the argument. One biologist at the Atomic Energy Commission in 1950, invoking the memory of heinous medical experiments at Nazi concentration camps, wrote that the studies might have "a little of the Buchenwald touch."

What would allow normally compassionate individuals to put their humanity on hold? There are no definitive answers, but in a seeming shift from the profound to the mundane, I can offer a few simple but valuable insights from, of all places, the movies: maybe the people behind the "Buchenwald touch" thought that their subjects were *not* people, or were at least of sufficiently low status that they slipped below the line.

Why, for example, is Henry F. Potter, the town potentate in *It's a Wonderful Life*, so indifferent to the welfare of his fellow citizens? People are not human beings to him, asserts good-guy rival George Bailey, "they're cattle." Thus to herd 'em up and move 'em out is not such a moral dilemma.

But cattle are still flesh and blood; we can dehumanize even further. In *Star Trek: The Motion Picture*, a robotic being from another world classifies people, and all other earthly creatures, as machines—no different except for their

particular chemistry and construction. Humans are unsentimentally viewed as mere "carbon-based units" whose testing, production, and repair, as well as disposal when their functional days are over, involve no more thought on the part of the user than upgrading a computer or junking a worn-out vehicle.

In real life, the treatment of people as livestock or machine equivalents is unfortunately not such a fantasy. The commoditizing mentality is especially applied to those who are disadvantaged, below some threshold or average, or simply deemed unworthy or undesirable by those in charge (who are presumably the real people). This is not only morally reprehensible, it's lousy engineering.

Good "technologists"—broadly defined to include decision makers of virtually every stripe—need to appreciate the characteristics of their raw material, product, process, or subject. Whether a person is dealing with animate or inanimate "units," long-term success requires that he or she recognize and respect, even if just for selfish purposes, their actual properties. Just as we wouldn't treat a Ferrari like a minivan, an orange orchard like a field of wheat, or a chimpanzee like a white rat, we should not regard a human being—*any* human being—like Elsie the Cow or R2D2.

To build valuable technologies, institutions, and societies we have to recognize the properties of the underlying human element. All people, whether leaders or followers and whether clever or slow, possess emotions, hopes, ideas, and talents. All have unique contributions to make, and all merit respect. These built-in traits are not always convenient, but they're an inescapable part of the equation. Ignore them, and, to paraphrase our president, the dog just won't hunt—at least, not for long.

Albert Schweitzer advised "a reverence for all life," both as a moral principle and as a precondition for a civilized and productive world. Now there was not only a great humanitarian but a great technologist.

—STEVEN J. MARCUS



# The Apple Report On PowerPC

## NUMBER 2 – RISC PERFORMANCE AND CROSS-PLATFORM COMPATIBILITY

Many of the most popular applications have been or are being optimized to take advantage of the high-performance PowerPC processor.

PowerPC chips are faster and less expensive than Pentium chips – so are the personal computers they will run.

A complete Macintosh system with PowerPC will cost well under \$2,500, but will offer better performance than higher-priced Pentium-based systems.

With SoftWindows, Macintosh with PowerPC will have the ability to run DOS and Windows applications, unmodified.

For more information about Macintosh with PowerPC, call 1-800-732-3131, ext. 150, in the U.S. We'll send you a copy of our informative, free booklet, *PowerPC Technology: The Power Behind the Next Generation of Macintosh Systems*. In Canada, call 1-800-665-2775, ext. 910.

In the first half of 1994, Apple will introduce a new family of computers that already has the entire computer industry standing on end.

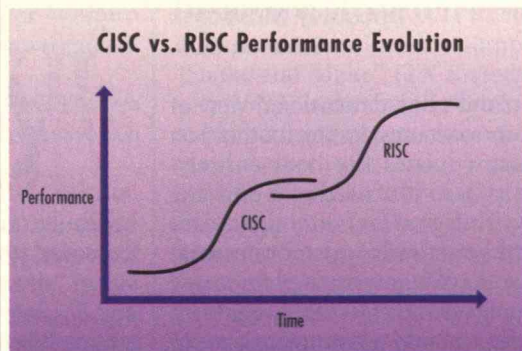
They will offer better performance than computers based on the X86 microprocessors. They will be extremely competitive on a price basis. And they will be compatible with Windows and DOS applications, by using SoftWindows software.

They will be based on the revolutionary new PowerPC™ microprocessor, created jointly by Apple, IBM and Motorola.

For the first time, desktop personal computers will take advantage of RISC chip architecture previously found only in high-performance workstations. This advance will make possible quantum improvements in the way we manage and work with information.

### RISC vs. CISC.

Tremendous advances have been made in CISC architecture over the years. However, the physical limitations of the new, high-performance CISC design mean that CISC chips must be significantly bigger and more complex, and must run at hotter temperatures to perform the same tasks as comparable RISC chips. Consequently, the newer generation of CISC chips, like the Pentium, are much more expensive to manufacture. Which means that personal computers powered by PowerPC chips can offer a significant advantage in price as well as in performance.



As you can see on the chart, RISC microprocessors offer dramatically greater potential for growth, leading us well into the next century and increasing the practicality of features like voice recognition, videoconferencing, object-oriented software and multimedia capabilities – functions that will be integral to doing business in the 21st century.

### More compatible personal computers.

Apple's new generation of Macintosh® personal computers built around the PowerPC chip offer the ability to run MS-DOS and Windows applications, as well as Macintosh software. Moving from one environment to the next will be seamless and, even more importantly, it will be effortless.



PC users who move to Macintosh with PowerPC will gain access to the large number of new applications which take advantage of the incredible performance of the new PowerPC chip.

### Higher-performance optimized applications.

When PowerPC microprocessor-equipped Macintosh computers begin shipping, software developers including Microsoft, WordPerfect, Adobe, Aldus and Claris will begin shipping new versions of their most popular software, specifically rewritten to take full advantage of the new processor's capabilities.

These optimized, sometimes called "native," applications will offer significantly faster performance than their MS-DOS, Windows or current Macintosh counterparts.

### Unprecedented value.

Because RISC-based personal computers cost less to manufacture than equivalent systems based on CISC chips, we will be able to make this technology available for well under \$2,500 for a complete mainstream desktop system.\* Competitive with a lower-performance, Pentium-based PC.\*\* Watch for Apple Report #3, coming soon.





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# Letters

## INVESTING IN SPACE

In "What Price, Columbus?" (*TR November/December 1993*), Alex Roland entirely overlooks the effects of five centuries of investment in technological and economic progress when he maintains that space programs cost a much higher proportion of GDP today than Columbus's explorations did in his time.

Compared with fifteenth-century Spain, twentieth-century America has a much larger percentage of income available to spend on such items as travel, entertainment, health care, education, and, yes, research and exploration. To see how absurd the Columbus analogy is, simply extend it to any other part of our economy. For example, Roland surely would not advocate cutting health-care expenditures, as a percentage of national income, back to fifteenth-century levels.

Roland also incorrectly asserts that we are "hocking not the crown jewels but our future" to fund the space program. Any first-year business student knows that debt is, in itself, neither good nor bad; it is the use to which debt is put that determines the wisdom of incurring it. America is not mortgaging its future with its paltry expenditures on research and exploration—it is doing so with its spiraling spending on consumption programs.

I can't help wondering whether the departments of Agriculture, Energy, and Transportation would stand up to the kind of cost-benefit analysis Roland recommends for the space program.

DOUGLAS J. McMAHON  
Belmont, Calif.

Alex Roland's one-dimensional view of our efforts to secure a lasting foothold on the cosmos misses the boat entirely. Humanity is in dire need of a unifying and inspiring goal far more significant than the pyramids or monumental works of old. We have an unprecedented opportunity to move forward, out from the cradle, to build a lasting presence in space. We must pool the best minds from

the world's developed and developing countries alike, for such an effort combining our many complementary talents and resources.

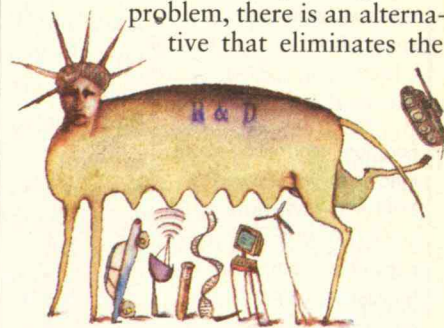
The overriding objective should simply be to develop space settlements in a logically progressive manner, building the new space infrastructure brick by brick, year by year, while not damaging the very economies on which we rely. If 0.7 percent over the lifetime of a space program is deemed too costly at this juncture, pare it back to 0.5 percent or 0.4 percent of our annual budget. To the ultimate benefit of earthly inhabitants, we may find that this exploration also provides us with clean space-based energy sources with a sizable economic and environmental payback.

GEORGE NEWMAN  
Boston, Mass.

## GET GOVERNMENT OUT OF R&D

In "Nurturing Winners with Federal R&D" (*TR November/December 1993*), Don E. Kash and Robert W. Rycroft charge that R&D spending by U.S. industry is inadequate and misallocated—for example, too little is directed at improving industrial processes. They therefore propose massive federal funding of "commercially oriented R&D" through a "politically insulated corporation," using money diverted from defense, space, and energy budgets.

However, if R&D spending is the problem, there is an alternative that eliminates the



bureaucratic blunders, administrative expenses, policy waffling, and congressional "oversight" inherent in the Kash and Rycroft proposal: give R&D funds attained through business taxes back to the private-sector firms that earned



them, accompanied by a warning that taxes will be reinstated if firms do not spend the money on improving manufacturing processes.

Inevitably government meddling in business is counterproductive for businesses and consumers; the only "winners" are gratuitously empowered bureaucrats. As the authors put it, in characterizing R&D funds now spent by federal defense, space, and energy agencies: "Vast sums are often justified as producing commercial benefits but rarely do." Would implementing the authors' proposal yield better results? Isn't "federally established, politically insulated corporation" a contradiction in terms?

DAVID A. NELSON  
Kirkland, Wash.

### EXPANDED CONTEXTS FOR ENGINEERING

In "Palchinsky's Travels: A Russian Engineer's Adventures Among Gigantic Projects and Small Minds" (*TR November/December 1993*), Loren R. Graham writes: "While American engineers and their followers in other countries praised Taylorism and Fordism for their ability to boost efficiency, Palchinsky asked what effects these methods might have on workers."

The author could have quoted from V.I. Lenin himself, who in April 1918 wrote, "In Russia, studies of the Taylor System and how to teach it must be organized, [while] systematically testing and adapting the system." Apparently, Soviet managers, after listening to their master's voice, were even more single-minded than U.S. and other Western Taylorers in forcing workers to give it their all.

ULF EDSTAM  
Lerum, Sweden

As Loren Graham writes, P.A. Palchinsky railed against the narrow education of Soviet engineering students because it allowed them to ignore the broad human context of their work. Hence gigantic projects were undertaken that often had little economic justification

and high environmental and human costs.

Engineering education in the United States has certainly not become as narrow as that in the former Soviet Union. On the other hand, there was a clear trend in the United States, following World War II, to emphasize mathematics and science and implicitly deemphasize the context—issues such as those relating to engineering-projects management, manufacturing processes, and environmental effects—in which engineering takes place. Clearly some of these contextual issues, such as manufacturing and design, are being addressed once again. Graham's article points out the need for paying even greater attention to them.

One issue facing engineering education is time. There is not enough time to address both the technical and contextual issues in a four-year program. This is one reason for developing Five-Year First-Professionals Degree Programs, as is currently being done in MIT's School of Engineering. Engineering schools will also need to pay greater attention to the educational needs of their graduates throughout their careers. Contextual issues become increasingly important as one moves up the career ladder. This will call for Second-Professional-Degree Programs for engineers in their late twenties and early thirties, which we are currently discussing with our colleagues in the Sloan School.

JOEL MOSES  
Dean, School of Engineering  
MIT

### DESIGN FOR MANUFACTURING

A basic unquestioned assumption in "Shake and Make" (*TR Reporter, January 1994*) is that small parts used in a manufacturing process have to be oriented before they can be assembled because they inevitably arrive in bulk. This assumption reflects the traditional factory concept in which each department, and sometimes each operation, is an independent cost center trying to minimize its own costs without considering the consequences to other departments.

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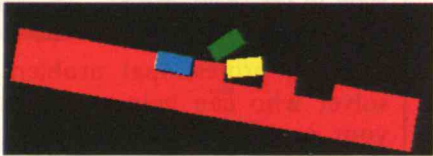
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Parts dumped into a bin not only become hard to assemble but also bulk handling can damage them and lead to product failures. Manufacturers should look for procedures in which such reorientation is not necessary, reducing product costs in the process.



Using the term "design for manufacturing" to describe parts designed for "shake-and-make" assembly seems oxymoronic. The point is to design for the entire manufacturing process—not for isolated steps within it!

LEO HERZENBERG  
Chicago, Ill.

### TIMELY ORGAN DONATION

In "Toward Remedying the Organ Shortage" (*TR January 1994*), Susan Reed insightfully concludes that the solution to the organ donor shortage is "likely to be a cocktail rather than a magic bullet."

There is no question that as the transplant waiting list grows and the donor pool shrinks because of increases in the incidence of HIV and hepatitis C and a decrease in motor vehicle fatalities, technologies such as animal-organ transplantation and organ bioengineering become more important. But while we must continue to invest in new technologies for the future, the 33,000 Americans awaiting transplants need an effective solution now.

Our experience shows that organ donation can nearly double if hospitals identify all potential donors, ask their families about donation, and request donation after the family members have

understood and acknowledged that their loved one is dead. It's also important that a hospital caregiver and coordinator together offer donation in clear, sensitive language. Today, unfortunately, hospitals follow this process in only a fraction of potential donor cases.

MICHAEL J. EVANISKO  
President, Partnership for Organ Donation  
Boston, Mass

### CORRECTION

"Scientific Flying on the Cheap" (*TR November/December 1993*) erroneously identifies the ER-2 and the Condor as the same aircraft. The Department of Defense put the Condor, a high-altitude pilotless aircraft, in storage late in 1992 after its funding was cut. The Condor was not used for atmospheric research. The National Aeronautics and Space Administration currently uses two ER-2 aircraft for such studies as well as remote sensing.

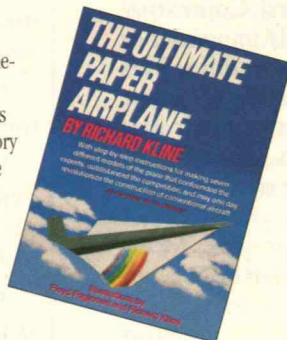
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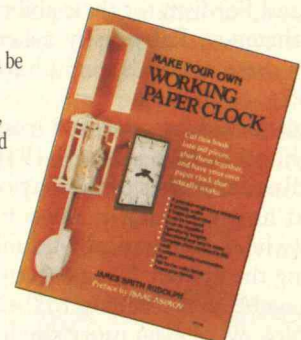


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# MIT Reporter

## MICROCHIP LASERS



From the tiny lasers in CD players to the bulky lasers used by industry to cut and weld metal, laser power comes at a price. Small lasers tend to be inexpensive but weak, while large lasers are typically powerful but costly. John J. Zayhowski, a researcher in the quantum-electronics group at the MIT-affiliated Lincoln Laboratory, has been working on a laser that seems to combine the best of both. His "microchip" laser can deliver bursts of light with up to tens of thousands of watts of power, qualifying it for applications such as eye surgery, laser radar, and satellite communications.

The manufacturing process for the laser, which resembles the steps used to make computer microchips from silicon wafers, is straightforward: take a chunk of crystalline material, slice it into thin wafers, polish and coat their tops and bottoms, and dice them into tiny squares. Each piece becomes an individual laser, with the polished, coated surfaces acting like mirrors for the material inside.

To operate a microchip laser, a user bombards—or "pumps"—the crystalline material with light energy, thereby causing the electrons in the crystal's atoms to hop from lower to higher energy levels, and back again. As the electrons return to the lower levels, they emit photons of light, which reflect between the mirrorlike surfaces. The number of photons grows until the light finally bursts outside the laser on the side opposite the "pump."

German researchers at Siemens AG developed microchip lasers more than 15 years ago. Using crystals containing large amounts of neodymium, which, when pumped, exhibits electron-hopping behavior, the Germans demonstrated the basic physics of the devices. But the concept remained a laboratory curiosity because of difficulty in obtaining uniform-quality crystals.

Then, in the late 1980s, Zayhowski and coresearcher Aram Mooradian decided to try a different type of crystal, an yttrium aluminum garnet doped with



*A "microchip" laser—which can be mass-produced from wafers in the manner of computer chips—can easily fit into the palm of a hand and deliver bursts of light as powerful as those from lasers many times larger.*

less neodymium (Nd:YAG), that chemists can grow much more uniformly. Nd:YAG had already proven itself in larger lasers, but the conventional wisdom was that such crystals couldn't produce powerful microchip lasers.

To overcome this handicap, Zayhowski first pumped his Nd:YAG microchip laser with a common diode laser similar to those found in CD players. The microchip laser emitted a beam still much weaker than what is required for practical applications.

To boost the power, Zayhowski added a common "switching" technique that moves the laser's energy between a temporary storage state and short, intense bursts of light. The process depends on the fact that temporarily altering one of the laser's "mirrors" so that it becomes nonreflective discourages the hopping electrons from returning to their lower energy states, enabling the device to store energy. When the surface is returned to a reflective state, much of the potential energy turns into light.

To construct a mirror with variable reflectivity, Zayhowski glued the crystal of Nd:YAG to a second crystal made of lithium tantalate. Applying a voltage to lithium tantalate easily alters the way light bends through that crystal, which

changes the connected Nd:YAG surface's reflectivity. In lab experiments, Zayhowski's switched microchip laser has delivered up to 25,000 watts of power in bursts lasting less than a billionth of a second.

Zayhowski is now working with more powerful diode-laser pumps, materials that may prove more efficient than Nd:YAG, and on a simpler switching technique that eliminates the need to apply a voltage to a second crystal.

The ability to emit short, intense bursts of laser light is critical in certain applications. In laser surgery, for example, short bursts could be used to injure or remove diseased tissue without damaging surrounding healthy tissue. Zayhowski's work has piqued the interest of Charles Lin, an assistant research professor at Tufts University's New England Medical Center in Boston, partly because of the cost of the laser. Eye surgeons typically use lasers with price tags of up to \$300,000. Because microchip lasers can be mass-produced like computer chips, Zayhowski expects that his lasers will be substantially cheaper. Having studied Zayhowski's laser design, Lin predicts that a microchip laser for ophthalmological use will cost less than \$100,000.

Microchip lasers should also prove useful in applications requiring rugged equipment, such as in radar onboard an airplane or in communication systems in satellites. That's because, since the mirrors are part of the crystal, the lasers' optics cannot become misaligned. In other lasers the mirrors are freestanding, separate components.

And the small size of microchip lasers may add to their utility. Tibor Juhasz, senior research scientist at Intelligent Surgical Lasers (ISL) in San Diego, notes that the base of the ISL laser with roughly comparable performance to Zayhowski's palm-sized device is desktop-sized.


But microchip lasers' overall reliability under varying conditions remains a question. The exact dimensions of the crystalline material used in a microchip laser are critical. Just as the length of an



organ pipe determines the pitch of the sound it produces, the length of a microchip laser—the distance between the two sandwiching mirrors—affects the color of light it emits. Changes in temperature, which could cause the Nd:YAG crystal to expand or contract, might disrupt the delicate relation between laser length and light color, and adversely affect the laser's performance. Zayhowski acknowledges the need for thoroughly investigating such effects.

—ALDEN HAYASHI

## LEARNING LANGUAGE INTERACTIVELY

 When one is learning a foreign tongue, there's nothing like listening to people fluently conversing in it. But in most language classes, the teacher is the only such speaker, so interactions are typically confined to "teacher talk" that lacks authentic dialogue, says Janet H. Murray, a senior research scientist in foreign languages and literatures at MIT. Although teachers sometimes try to compensate by showing videos of native speakers, these tools have severe limits. The pace at which the characters use complex sentence structures usually overwhelms students who don't have immediate access to aids such as glossaries. And the passivity of the situation limits them to watching only one story and one outcome.

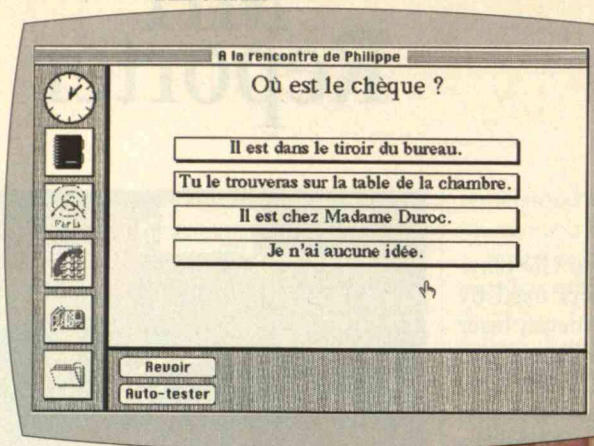
Under Murray's guidance as director of the Laboratory for Advanced Technologies in the Humanities (LATH), educators, computer programmers, and filmmakers shooting on location are developing interactive video programs to present language. Along with moving images, the programs include stills and computer features that enable users to request help at any time. For example, users can click on controls to review and preview the video, open a transcript of spoken comments, and cross-reference other examples of a phrase or gesture. Through such offerings, interactive video enables students to learn at their own pace while being exposed to native speakers of vary-

ing social classes, ages, and backgrounds presenting authentic, unsimplified material, according to Murray.

Yale University Press recently published one of the group's French programs, *A la rencontre de Philippe* (Meeting with Philippe), which had previously been distributed on a test basis to dozens of colleges and high schools nationwide. Yale also plans to publish *Dans le quartier Saint Gervais* (In the Saint Gervais neighborhood) in 1995. Boston Latin Academy and Noble and Greenough School in Dedham, Mass., were scheduled to begin testing a program for learning Japanese, *Tanabata: The Star Festival*, in February.

Whereas some interactive language programs simply quiz users on vocabulary or conjugation, LATH programs focus on overall language comprehension, according to Murray. In the *Philippe* software, students begin by viewing a video of Philippe, a Parisian whose girlfriend has just thrown him out of their home. He asks viewers to help him find a new place to live. At various times users choose which action they want Philippe to take. For example, by using a mouse to click on a newspaper sitting on his desk, they can study apartment ads that appear on screen. Then they can click on his answering machine and listen to his messages from people such as real-estate agents. Students' decisions determine one of seven possible outcomes for the story.

The private K-12 Dalton School in New York City has been using the *Philippe* interactive video and other multimedia programs as part of its New Laboratory for Teaching and Learning, which integrates information technology into the school's educational offerings.



*A student using an interactive video designed to teach French comprehension can alternate between viewing a story about a young Parisian named Philippe and exploring related activities on a computer.*



Working on Macintosh computers linked to videodisc players, Dalton high-school students have been using the *Philippe* program, which Caren Steinlight, Dalton's project manager in foreign language, commends for its versatility. Beginning students tend to focus on basic vocabulary—in this case, involving furniture and apartments—while experienced students can concentrate on learning conversational expressions, gestures, and even social skills, she says.


Steinlight adds that *Philippe* users work hard at trying to comprehend the material so they can influence the video's outcome. And several groups of students have completed independent projects that expand the *Philippe* story. "What is so exciting about the new media is that the kids want more," Steinlight says. For example, one group designed an alternate ending for the program. Acting as real-estate agents, another group put together a promotional package to sell Philippe an apartment in the historical Marais quarter of town.

Despite such responses, LATH developers recognize that interactive programs shouldn't be the only tool used in teaching a foreign language. As always, classroom discussions are critical to developing students' speaking ability. But Steinlight notes that interactive programs can promote discussion. Her students ask her such workaday questions as, "Can I scan these images in? When is it my turn to use the mouse?" And, she says, "they say these things in French."

—SHAWNA MOOS



## GROWING NERVES

 Lop off the tail of a worm, and a new one will grow back in its place. But sever a mammalian nerve, or destroy the inner layer of a piece of skin, and the damage is permanent.

In the 1980s, Ioannis V. Yannas, a professor of mechanical engineering at MIT, developed an artificial-skin gauze that, when placed on an open wound, stimulated production of new dermis—the innermost layer of skin. While this technology, already used to treat several burn patients, awaits approval for widespread use from the U.S. Food and Drug Administration, Yannas is engineering a variation to regenerate damaged nerves. In preliminary tests on rats, the material has prompted severed leg nerves to grow—crippled rodents have even regained their ability to walk, though with less stability than normal rats.

### An Interim Scaffold

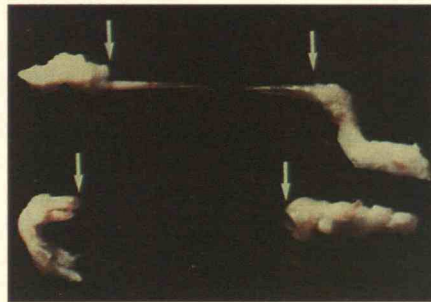
Yannas's "devices" are dense meshworks of interwoven protein and sugar chains: specifically, strands of the protein collagen and chains of glycosaminoglycan (GAG), a complex sugar. The model for the templates is the network of molecules known as the extracellular matrix (ECM) that exists throughout the body. A kind of biological glue, the ECM holds tissues together by housing their cells inside its cubbyholes. Similarly, Yannas's engineered gauze provides an interim scaffold upon which cells in a damaged region can attach themselves and grow.

To construct the artificial nerve matrix, Yannas had to create appropriately sized holes for new nerve cells to inhabit. He poured a GAG-collagen solution into silicone tubes, which he froze so that the water in the material would form ice crystals. The temperature at which the tubes froze determined the crystals' size: the lower the temperature, the smaller the crystals, for example. He then vaporized the ice, leaving pores.

Yannas has tested his nerve matrix in rats with severed sciatic nerves, which

run from the base of the spinal cord down through the leg. When that nerve is disrupted, electrical impulses from the brain can't reach leg muscles, leading to paralysis and atrophy. The damaged nerve ends usually sprout new growth, but without guidance, the shoots, roughly 5 millimeters long, rarely reconnect to each other; instead, they quickly die. Yannas remedied this by implanting into each affected leg a 20-millimeter-long silicone tube filled in the center with 10 millimeters of artificial-nerve matrix. He then slipped the stumps of the severed nerves into the tube's empty ends and stitched them in place.

After six weeks the nerve ends connected and the rats began recovering muscle tone in their legs. But the regrown nerves were weaker than normal



*A new nerve is visible (top) six weeks after severed ends were placed in a silicone tube filled with a scaffold mimicking the body's. When only the tube was used, no nerve formed, just thin connective tissue (bottom).*

nerves because they had fewer axons, which are responsible for transmitting electrical impulses to neighboring cells. The regrown nerves transmitted electrical signals of only about half the usual intensity. Due to the reduced number of axons extending into the rats' feet, the muscle in their heels never completely recovered, impairing their ability to grasp with their toes and weakening their balance.

In a separate experiment, Yannas also found that two nerve ends could each bridge 7.5-millimeter gaps in a silicone tube filled in the center with artificial

matrix. This research showed that nerve shoots could grow substantially more than the length observed under natural conditions, which might prove valuable in some cases.

To increase the number of axons, Yannas is now testing variations in the diameter of matrix pores. He is finding that the greatest number of axon connections between nerve ends occurs when the pore diameters approximately equal the axons' diameters. Yannas hypothesizes that this is due to nerve growth factors—proteins that activate axon elongation and that are released by nerve stumps—binding to the inner surface of matrix pores. The closer the fit between axon and coated pore, the more likely the axon gets a growth boost, he believes.

Yannas is also trying to determine how long the artificial matrix should stay in the body before breaking down and naturally flushing out. The problem relates to the matrix's manufacturing process. Although too few connections form between the collagen and GAG to create a matrix when they are simply mixed and frozen, Yannas was able to increase the number of crosslinks and develop a matrix by further dehydrating the material and soaking it in a chemical called glutaraldehyde. But if too many crosslinks form, the matrix lasts so long that it actually impedes the axons' elongation. (The more crosslinks, the longer the period before a destructive enzyme called collagenase, which is present in the nerve-end area, breaks down the matrix.) Yannas has found he can alter the matrix's degradation rate by changing the length of the glutaraldehyde-soaking period. The most effective matrix so far has remained in the body four weeks.

Yannas also says he wants to replace the silicone tubing with a degradable material before he tests the nerve-matrix technology on humans. Toward that end Aria Landstrom, a graduate student in mechanical engineering, is developing a collagen tube, which Yannas says could be ready for testing in as little as one to two years.—LIZ LEMPERT



# Trends

## Staying out Cold under the Knife

As Patricia Lodge was being anesthetized before her surgery, she thought her next waking moment would be in her hospital room. Instead, she emerged from unconsciousness into a living nightmare. She woke up in the middle of her own operation.

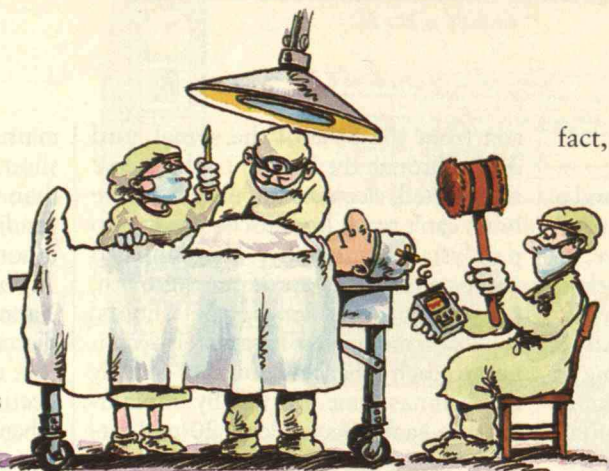
She couldn't open her eyes, but she could hear everything. Panic had filled the operating theater: Lodge was hemorrhaging. Her surgeon, unable to stop the bleeding, was cursing furiously. A nurse slipped and fell in Lodge's blood.

Lodge was terrified. "I wanted to yell, 'Stop! Stop! I'm here!'" But she couldn't move or utter a sound. She was still under the effect of a paralyzing drug. "I managed to lift my right index finger just a little," she says. "I heard somebody yell, 'Oh God! She's coming around! Get her out! Get her out!'"

Of the 20 to 25 million people who undergo surgery every year, researchers estimate that as many as 250,000 remember waking up during general anesthesia. Unable to move, they look as if they are unconscious, but they are not.

Most awaken in the midst of a normal procedure, drift back into unconsciousness, and are unaffected by the experience. But some have horrific experiences, as Lodge did, and suffer post-traumatic stress disorder—they can't sleep, they have nightmares, their emotions are blunted. An even smaller percentage—no one really knows how many—feel pain. One patient recalls: "I remember them splitting my ribs open. The stab wound I got was bad, but the surgery was a lot worse."

At the base of such terror is a little known fact: anesthesiologists don't have any sure way to monitor patient unconsciousness. It's not simply a matter of checking to see if the patient is sleeping, notes Henry Bennett, an experimental psychologist and associate professor of clinical anesthesiology at the



University of California, Davis, who has studied 60 people suffering from post-traumatic stress disorder after awakening during surgery. "Anesthesiologists say that people go to sleep during surgery, but that's an obfuscation," he says. "There is no relationship between sleep and anesthesia."

"Sleep is a physiological state," explains Peter Sebel, professor of anesthesiology at the Emory University School of Medicine. "If someone sticks a knife in you when you're sleeping, you wake up. If you are under anesthesia, you are in a nonphysiological state, a reversible state of unconsciousness, drugged to the point of reflex suppression."

What is also not generally understood is that people who undergo general anesthesia usually receive four different types of medications: a mild tranquilizer to make them forget events, narcotics to block pain, a drug to make them lose consciousness, and an agent that paralyzes patients so they won't move when surgeons severely stimulate nerves, such as when making an incision or shoving a breathing tube down their throats.

People usually wake up during operations if they are unexpectedly tolerant to the drug that induces unconsciousness or if the anesthesiologist makes a mistake in administering it. Emergencies during surgery, such as when Lodge hemorrhaged and suffered a resulting drop in blood pressure, may also cause a patient to wake up because physicians must compensate for a weakened condition by decreasing anesthesia to maintain blood pressure, avoiding injury to the patient's brain, heart, and kidneys. In

fact, some people who undergo emergency surgery are too close to dying to be given any anesthetic because the drug would finish them off.

Researchers have tried to develop consciousness monitors for more than 50 years, says Ira Rampil, director of neurophysiological monitoring and assistant professor of anesthesiology at the University of California San Francisco Medical School. But

only recently has the work begun to demonstrate any encouraging results.

One promising new technology, called "40-hertz auditory steady state response," is similar to an electroencephalogram (EEG) in that it detects brain waves—electrical signals that pass from the cerebral cortex through the skull. This machine, however, screens out all of the signals except those that the brain makes in response to a 40-hertz sound signal. Gilles Plourde, an anesthesiologist who is testing the technique at Royal Victoria Hospital in Montreal, says that anesthetic drugs seem to interfere with a part of the brain that relies on 40-hertz signals to communicate between the cortex and thalamus. "If the cells lose the ability to generate or detect the signal," he says, "you lose consciousness."

Plourde has found an "excellent correlation" between the absence of a brain-wave response to the 40-hertz signal and unconsciousness. In fact, the technique has successfully monitored patient unconsciousness with more than 100 anesthetic agents.

Another device, dubbed the Face machine, detects the rate of contraction of four groups of muscles in the face that readily communicate what a person is feeling: The frontalis group expresses surprise, the corrugator makes a frown, the zygomatic forms a smile, and the masseter clenches the jaw. If more frowning and jaw-clenching goes on than surprise or smiling, a person may be experiencing either pain or awareness, and may be on the verge of waking, explains UC Davis's Bennett.



Two other techniques, originally developed to predict a patient's likelihood of moving while under anesthesia, may also hold promise for monitoring awareness. The first, called the bispectral EEG, is being tested by Sebel at Emory to look for a specific brain wave associated with a person's physiological response to a stimulus. Because the level of unconsciousness is so deep when this signal is absent, developers believe the technique may someday be used to predict when a patient is about to wake up.

The other approach, called mid-latency auditory evoked potential (MLAEP), analyzes signals that the brain makes in response to sound. Anesthesiologists in Great Britain and Germany are testing the device by using the presence of an MLAEP signal to stimulate the delivery of anesthetic during surgery, on the theory that patients who have an MLAEP response are not unconscious enough. Like the bispectral EEG, it has thus far been used to monitor paralysis, but researchers expect it could also be used to detect awareness.

When these devices are fully tested and ready for the market, which UCSF's Rampil believes will take at least two years, they may receive at best a lukewarm reception. For instance, they may not be in great demand by surgeons, who are usually more concerned about maintaining a safe level of paralysis for patients than they are about measuring awareness.

"That's not to say that patient awareness isn't a problem," says Emory's Sebel. "In fact, it accounts for three percent of the suits against anesthesiologists. Also, I think from a humanitarian point of view people need to be unaware during surgery."

In the end, the decision to purchase such machines will come down to an analysis of cost versus benefit. Estimates range from \$10,000 to \$30,000 for such devices. Is that too much? Maybe not. One survey by anesthesiologists showed that 50 percent of patients interviewed before surgery say their main fear was waking up during the operation.

—JANE STEVENS

## Hydropower That's Clean and Green

Hydropower usually gets rave reviews as a means of generating electricity without producing the sulfur and nitrogen oxides responsible for acid rain or the carbon dioxide that contributes to global warming. But because the huge dams needed for cost-competitive hydroelectricity may flood thousands of acres of valuable land, block fish migration, alter the delicate ecological balance of rivers, and even displace whole communities, this clean technology is not always as green as many environmentalists would like.

A radical new approach to this energy technology, invented by Alexander Gorlov, a former Soviet hydropower expert who helped design Egypt's Aswan Dam, may help ease these concerns. Gorlov, now a professor of mechanical engineering at Northeastern University, says that instead of dropping dammed water onto turbines that spin and generate electricity, his patented hydropneumatic system is designed so that water never touches the turbine. Instead relatively slow-moving water is used to blast air past its blades.

According to Gorlov's calculations and tests with a prototype, his system

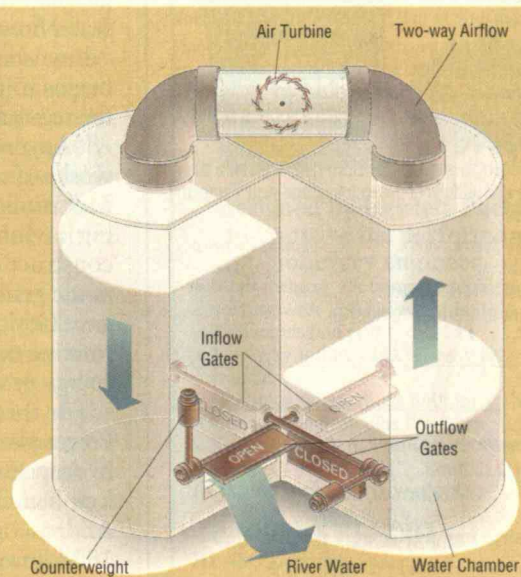
can efficiently generate electricity with water flowing from a dam that's only 10 feet high. Or, if a river flows fast enough, the device requires no dam at all.

"Contemporary hydropower is such a contradiction," says Gorlov. Rivers rarely flow fast enough to turn turbines at the high speed needed to generate utility-scale electricity. That's where dams come in, creating an abrupt, vertical drop that increases water speed and thus turbine speed. The higher the dam, the faster a turbine turns, but the more pronounced the structure's negative side-effects. What's more, most of the best sites have already been developed.

Gorlov thinks he has found a way to harness slow-moving plains rivers without damming them up. His technique could also use some of the 80,000 abandoned dams—originally built in the 1800s and early 1900s for grinding grain and powering looms or other machinery—that are too small to generate electricity with conventional hydropower technology.

In fact, it's quite easy to create a mini-version of Gorlov's hydropneumatic system at home. Take a plastic cup and poke a hole in the bottom. Hold it upside down in a stationary position near the bottom of an empty, stoppered sink, and turn on the tap. Water rising in the

*Controlled by simple gates and counterweights, the two water chambers of this hydropneumatic device alternately fill and empty like a beating heart, whooshing air back and forth through a connecting tube. Air coming from the right chamber lifts the turbine's wing-shaped blades upward, while air from the left pulls the blades (now inverted) downward, spinning the turbine in one direction to generate a constant flow of electricity.*





cup forces the air trapped inside out through the hole. Unplug the sink, and water draining out of the cup creates a vacuum that sucks air in through the hole. The larger the ratio between the cup diameter and the hole diameter, the faster air flows in and out.

A refrigerator-sized plexiglass prototype unit in Northeastern's Hydropneumatic Power Laboratory is a bit more complicated. It consists of a pair of meter-tall chambers connected at the top by a tube containing an air turbine the diameter of a dinner plate. A quick tug on a lever starts a 600-gallon-per-minute flow of water through the system. One chamber fills, pushing air past one side of the turbine; the other empties, sucking air from the tube.

Whereas a standard turbine uses a conventional fan blade that spins ac-

cording to the direction of the water that pushes aside its broad angled face, the so-called counter-rotating turbine in Gorlov's system uses a blade shaped like an airplane wing that creates lift to spin the turbine when the airflow rushes over its front edge.

The blades are placed around the turbine in paddlewheel fashion. So as the first water chamber fills, air whooshes through the tube and hits the front of the paddlewheel, lifting each blade upward as it spins past the airflow. As the first chamber empties and the other fills, air races in the opposite direction through the tube and over the blades at the rear of the paddlewheel. The blades, having spun halfway around the wheel, are now upside down, so the "lift" pulls them downward. Thus, even though the airflow reverses with each cycle, the turbine rotates in the same direction, generating a constant flow of electricity.

Simple gates and counterbalances coordinate the operation of the unit as the chambers alternately fill and empty. At the top of the cycle, water pressure inside the filled chamber exceeds the pressure exerted by a one-pound counterweight on the outflow door at the bottom of the chamber, popping it open. The same motion closes the outflow gate in the opposite chamber, thanks to a single shaft that controls the two gates. As water flows from the full tank and heads "downstream," its empty neighbor begins to fill. This pattern repeats with the regularity of a beating heart.

"Anyone who sees Gorlov's system at work is greatly impressed," says Michael McCormick, professor of civil engineering at Johns Hopkins University. To construct an experimental hydropneumatic generator in Maine, McCormick gave Gorlov an industrial-sized counter-rotating turbine he designed for a wave-energy project in Japan.

For this crucial test, Central Maine Power plans to build a commercial-sized hydropneumatic generator at an existing low-head hydropower station on the Androscoggin River in Lewiston. The 100-kilowatt system will operate side by side with a conventional turbine genera-

tor, giving the company an opportunity to compare the newcomer against the proven technology.

Central Maine Power's preliminary analyses suggest it will be cheaper to build hydropneumatic systems than their conventional cousins at low-head sites. The smaller, lighter equipment requires less construction and fortification at the powerhouse, and there's no need to excavate deep into the riverbed to make room for spinning turbines.

If the tests are successful, the company says it could build small utility generating stations at a number of existing low-head dams in its territory; and it could build generators for riverside businesses that want to make their own electricity. "We're also intrigued with the idea of using hydropneumatic systems for isolated homes or villages near a small flowing river but far from the existing power grid," says Chad Clark, Central Maine Power's supervising research engineer.

Gorlov has bigger ideas. A sketch on the wall of his office shows a hydropneumatic powerhouse generating electricity from rising and falling tides in a rocky Maine bay. He also recently submitted a plan to the U.S. Army Corps of Engineers to generate electricity in Massachusetts's Cape Cod Canal. He even envisions fleets of his generators sitting atop floating platforms in the Gulf Stream or other ocean currents, generating electricity for remote island communities.

But before such plans take shape, engineers at Central Maine Power first want to find out not only whether the hydropneumatic systems will be cheaper to build than conventional hydropower systems, but whether they will be as efficient. They also want to test whether the devices will work in the winter on frozen rivers and whether they will allow fish to migrate more easily and safely than through rapidly spinning turbines.

"Gorlov's idea is intriguing, and his machine is unique," says John Smith, chief of coastal development for the Army Corps of Engineers. "But you have to build and operate one out of steel and concrete before concluding that it works."—P.J. SKERRETT

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## Doing Science Justice in the Courtroom

Did exposure to chemicals from a hazardous-waste site lead to a neighbor's assorted illnesses? Did stress at the workplace worsen an employee's coronary artery disease? Is DNA fingerprinting a dependable method for identifying individuals? Such scientific questions have become commonplace in today's courtroom. In fact, according to a government-sponsored survey conducted in 1989, "substantial" scientific and technical issues arose in 20 to 30 percent of all federal trials. And a more recent study in California found that 86 percent of civil jury trials that came to a verdict in 1985 and 1986 included testimony by a technical expert.

Unfortunately, judges are often at a loss to divine good science from shoddy science in such cases, especially when warring parties pit their legions of highly credentialed expert witnesses against each other. To help judges determine the merits of scientific testimony, the U.S. Supreme Court handed down its first-ever decision last summer—after passing up dozens of opportunities in recent decades—about what kind of scientific and technical testimony is appropriate in legal trials. Legal experts from many quarters say that if the ruling can be effectively implemented, it should sharpen the way the courts handle technical issues.

The case in question, *Daubert v. Merrell Dow*, concerned an alleged link between birth defects and Bendectin, an



antinausea drug for pregnant women. In the case, William and Joyce Daubert of San Diego, Calif., sued Merrell Dow Pharmaceuticals—the makers of Bendectin—when their son Jason

was born with malformed limbs after Joyce Daubert took the drug during the first trimester of pregnancy.

The science of the case was at issue because some in vitro and animal studies suggest that the drug does cause birth defects, and pharmacological studies reveal similarities between the structure of Bendectin and other substances known to cause birth defects in humans. In fact, based on results such as these, Merrell Dow soon found itself facing thousands of lawsuits like the one brought by the Dauberts. In response, the company removed Bendectin from the market in 1983 after more than 10 million women had used the drug for two decades.

### Peer-Reviewed Evidence

But most of the lawsuits against Merrell Dow faltered because the courts generally demand direct evidence of injury to humans in such cases. And none of the more than 30 published studies involving over 130,000 patients have been able to establish a statistically significant link between Bendectin and birth defects in human infants.

One aspect of the Daubert case, though, ultimately drew the attention of the high court. Both the California court and a federal appeals court refused to hear the testimony of several of the plaintiff's key expert witnesses because their results, though directly relevant to the case, had not been published in a peer-reviewed journal.

For example, the courts refused to hear evidence from Shanna Helen Swan,

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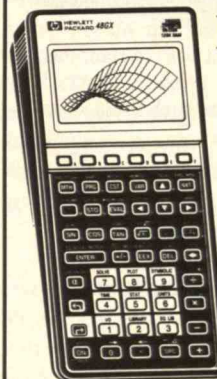
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a researcher at the California Department of Health and Human Services who headed the agency's section that determines causes of birth defects. Swan, a biostatistician who has served as a consultant to the World Health Organization, the Food and Drug Administration, and the National Institutes of Health, reanalyzed the 30 human studies on Bendectin, modifying the control group in each case in a way she believed more accurately reflected the data. Rather than using children born with any kind of birth defect as a control, as was done in the original studies, Swan used only children born with chromosome abnormalities. By so doing, Swan established a significant correlation between taking the drug and bearing a child with malformations like those suffered by Jason Daubert.

Swan says that she and a coauthor simply never found time to write up the analysis. But she argues that her findings were acceptable to scientists in her field because she presented her work to the Society for Epidemiological Research in 1984, and to be selected, her talk had to pass an informal peer review. The courts disagreed.

The decision created a stir in the research community. In fact, by the time it reached the Supreme Court, *Daubert v. Merrell Dow* had drawn no fewer than 20 amicus briefs (advice offered by "friends of the court") from some of the country's largest and most prestigious scientific organizations, including the National Academy of Sciences, the American Medical Association, and the American Association for the Advancement of Science.

Interestingly, most of these organizations did not champion Swan's right to be heard, siding instead with the decision of the lower courts. To ensure a high level of scientific discourse in the courtroom, they said, judges should require that an expert's evidence be well scrutinized by the scientific community. Peer review, they held, is a much better arbiter of scientific merit than the courts ever could be. If the Supreme Court liberalized its rules on the kind of expert

testimony allowed in such cases, these groups warned, it could cause an avalanche of "junk science" in the courts.

But several well-known scientists—such as Harvard paleontologist Stephen Jay Gould—warned the court not to let scientific orthodoxy alone determine what kind of evidence should be allowed in court. Because novel types of research often take a long time to receive widespread acceptance in the scientific community, these researchers said, a court should weigh research that experts offer in the courtroom on its own merits, not by how popular it is in the scientific community.

## Judge as Gatekeeper

To deny Swan her day in court, the lower courts relied in large measure on a 70-year-old precedent, the only other time federal courts have ruled broadly on the issue of scientific testimony. In that earlier case, *Frye v. United States*, the judge denied the use in court of a blood pressure "deception" test—essentially a crude precursor to today's lie-detector test—because it had not yet gained "general acceptance in the particular [scientific] field in which it belongs." The notion that scientific testimony needed to reflect such general acceptance had come to be known among legal scholars as the "Frye test."

Though the Frye test has been debated for decades, it continued to be widely cited, even after 1975 when Congress enacted a new set of "Federal Rules of Evidence" to clear up some emerging ambiguities in court precedents. One such rule says that judges can give expert witnesses some leeway to form opinions as long as the data they cite seem to be reasonable.

But because these rulings did not specifically address the status of the Frye test, that decision was left for the Supreme Court, which unanimously agreed that the Frye test was no longer valid. Judges, it said, cannot use the notion of general acceptance alone to exclude novel scientific evidence nor



deny evidence simply because it has yet to be published.

Rather, judges must weigh the merits of the research themselves—the same way scientists do. The ruling instructs judges to determine whether the methodology used is sound: whether it has been—or can be—tested, and how precise its predictions are. The judges are also supposed to ascertain how widely a given theory has been challenged by other scientists. But this, the Supreme Court says, cannot be used as a litmus test for barring testimony.

While many judges welcome the Supreme-Court decision, the ruling has resulted in confusion among the lower courts over how to interpret and implement the verdict, says Joseph Cecil, a project director at the Federal Judicial Center, a federally funded organization responsible for training federal judges. Indeed, the question that has yet to be answered is how judges are supposed to reliably exercise their expanded gatekeeper roles in such trials. For instance, Chief Justice Rehnquist, in his partial dissent (he agreed that the Frye test is no longer valid), expressed confidence in federal judges but said he didn't believe they had "either the obligation or the authority to become amateur scientists" to perform their jobs.

Fortunately, plans are being devised to help federal judges become familiar with the science they now need to know. The Carnegie Commission on Science, Technology, and Government, which studied the issue closely for the past three years, is underwriting a project at the Federal Judicial Center to compile a series of manuals about how to wade through the details of such specific fields as epidemiology, toxicology, and statistics. Part textbook, part source listings, the manuals, which are scheduled to be out by the end of the year, are expected to offer glossaries of scientific terms, explanatory sections about key techniques such as gene splicing and statistical regression analysis, and recommendations on where to turn for more detailed information.

—SETH SHULMAN



## AIDS: the Exhibit

AIDS educators have long been frustrated by school officials and politicians who refuse to give kids the unadulterated facts about HIV, especially concerning the role of sex and intravenous drugs in spreading the disease. But now a group of educators is sidestepping such barriers by presenting the discussion in a setting many people view as more "scientific"—the science museum.

Created by the National AIDS Exhibit Consortium with a \$500,000 grant from the Centers for Disease Control, the exhibit is scheduled to begin a three-year nationwide tour this spring. The nation's first science exhibit on AIDS, it will appear at the science museums in Philadelphia, New York, Atlanta, Cleveland, Miami, Buffalo, Lexington, Ky., Richmond, Va., Hartford, Conn., Dayton, Ohio, and Macon, Ga.

Geared primarily for children and

*A novel science-museum exhibit about AIDS attempts to give young people undiluted facts in an entertaining way. Here students spin specially marked dice that help illustrate the odds of getting AIDS from risky sexual behavior.*

teenagers, the show tries to combine science education with entertainment to cover a wide range of AIDS-related issues, including everything from a sophisticated description of the life cycle of the virus to its impact on victims and their families.

The first thing you see when you enter the show is a multicolored model of the HIV virus, enlarged two and a half million times. The function of each of the color-coded parts—a yellow protein shell, purple surface proteins, red host-cell proteins, coiled HIV genes made of copper, and a pink stubby protein core—is explained in an accompanying panel. The viewer also learns that HIV dies easily when exposed to heat, water,



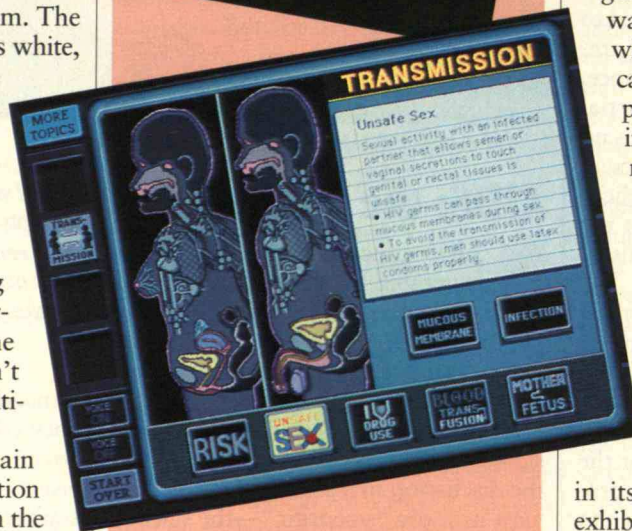
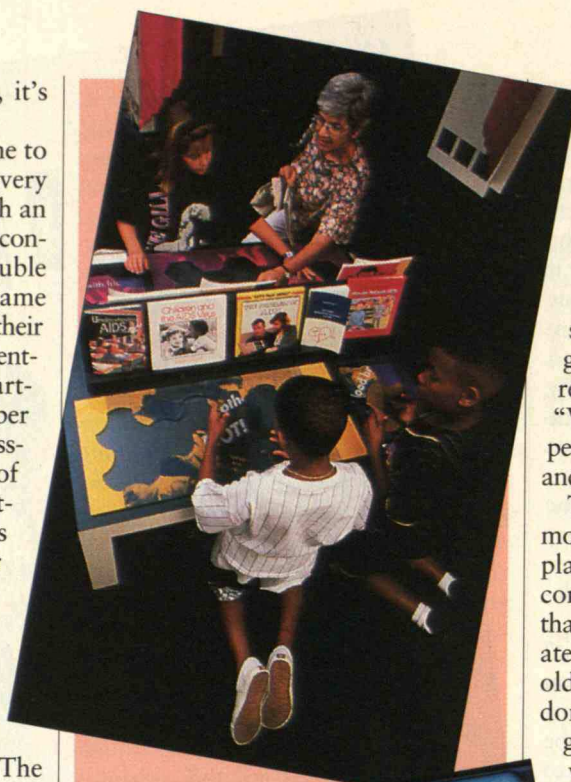
or air, but once inside the body, it's impossible to destroy.

Another display uses a dice game to teach the statistical concept that every time you have unprotected sex with an additional partner, your chances of contracting the virus don't simply double but increase exponentially. The game consists of three cages that spin on their axes. Each cage contains dice representing the number and type of sex partners. And each die includes a number of faces painted with a skull and crossbones to represent the probability of encountering an HIV-positive partner. As the number of dice increases from one cage to the next, the player sees firsthand how much more frequently a skull and crossbones turns up in cages with more dice.

One exhibit even uses a Pac-Man-like computer game to explain how T-cells work as leaders of the body's immune system. The T-cells, depicted on the screen as white, egg-shaped generals wearing hats with gold stars, lead armies of white blood cells against raggedy red, green, and blue cartoon invaders, which represent bacteria and viruses. The HIV virus, shown as a sinister gray monster with glowing red eyes, can kill the T-cell generals. Without their leaders, the masses of white blood cells can't fight off the invaders, which multiply and take over the body.

Because youngsters are the main target of the show, AIDS prevention is a primary message. Displays in the prevention section include some frank discussion and uncensored images. For example, one computer presentation that demonstrates the proper way to use a condom clearly shows a man's penis becoming erect and discusses such fine points as squeezing air from the tip of the condom to allow room for the semen during ejaculation. Another terminal shows a close-up of a vein in a person's arm and what happens when it is injected with a contaminated needle.

"Some people were skeptical and wor-



*The AIDS exhibit targets both young children and teenagers. Activities range from puzzles (top) showing that HIV cannot be transmitted simply by playing with friends to interactive computer programs (directly above) that explain how HIV is actually transmitted.*

ried about why and how we were doing this," says Roberta Goldschlag Cooks, a psychiatrist and the new exhibits director at Philadelphia's Franklin Institute, where the show was developed. For example, the Archdiocese of Philadelphia was "uncomfortable" that the exhibit presented information on condoms so graphically. But developers did not revise that part of the show, she says. "We felt it extremely important to give people honest information on condoms and their uses."

To protect young children from the more explicit material, some of the displays are marked by crimson banners containing PG-10 ratings, suggesting that the treatment may not be appropriate for children younger than ten years old. And despite its candor about condoms and IV-drug use, the show does gloss over some topics. "People don't want to talk about oral or anal sex, which is so important in AIDS education," says Alissa Ralston, an independent AIDS-education consultant in San Francisco who was part of a national advisory committee that reviewed information for the show. "There's a pull between wanting to get out all the information, and not wanting it to be so offensive that parents won't bring their children to see it," she says.

The best solution, says Ralston, is to maintain a balance of information. For example, in its treatment of teenage sex, the exhibit not only details some "safe sex" practices, it also includes a wall-size list of "101 Ways to Make Love Without Doin' It," such as taking a carriage ride, strolling arm in arm, and eating dinner by candlelight.

The exhibit also hopes to reach teenagers by merging the technical with the human aspects of the epidemic. On the front wall of the exhibit is a larger-than-life photo of Krista Blake, an Iowa teenager, standing in a wheat field. Posted alongside her image is her message to teenage America about AIDS:



"You think only certain people can get it. Like people who mess around a lot...or use drugs. You think it happens mostly in big cities...certainly not in little towns." The message continues, relating how she got the HIV virus from her boyfriend in a town of just 5,000 people.

Elsewhere, a wall is filled with crayon drawings and messages from children, such as this one written on a backdrop of purple flowers and irregular-shaped red hearts:

"my mommy  
i love you, i miss you  
i want you to have hearts and flowers  
i wish you didn't die."

An exhibit like this isn't a magic bullet, says Francis Stoffa, executive director of the Philadelphia AIDS Task Force. But it is an important new avenue for getting out the message about AIDS to teenagers, which he says is the group that is both at greatest risk and the most difficult to reach. In fact, while AIDS cases in adolescents and adults under age 25 make up only about 4 percent of the estimated 14 million people worldwide infected with HIV, this age group is contracting the disease faster than any other. At present, of teenagers tested in New York City, 1 in 10 turn up HIV-positive.

Developers of the AIDS exhibit readily concede that their approach—showing models of the virus, how it gets into the body and disarms it, and then what that does to real people—is nothing radically new. In fact, it is merely a more comprehensive version of what AIDS advocacy groups nationwide have promoted for years.

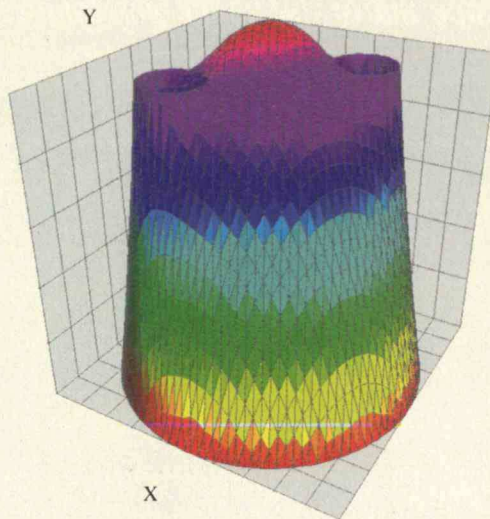
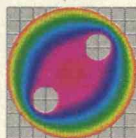
But the developers wanted to capitalize on what Martin Weiss, manager of biology at the New York Hall of Science and scientific adviser and project manager for the exhibit, describes as the special position science museums hold: a setting that young people and their parents perceive as both nonthreatening and nonpolitical. "In our society, scientists are looked upon as purists and experts," he says. "Thus, information presented in a science museum is accepted as truth."

—MUBARAK DAHIR

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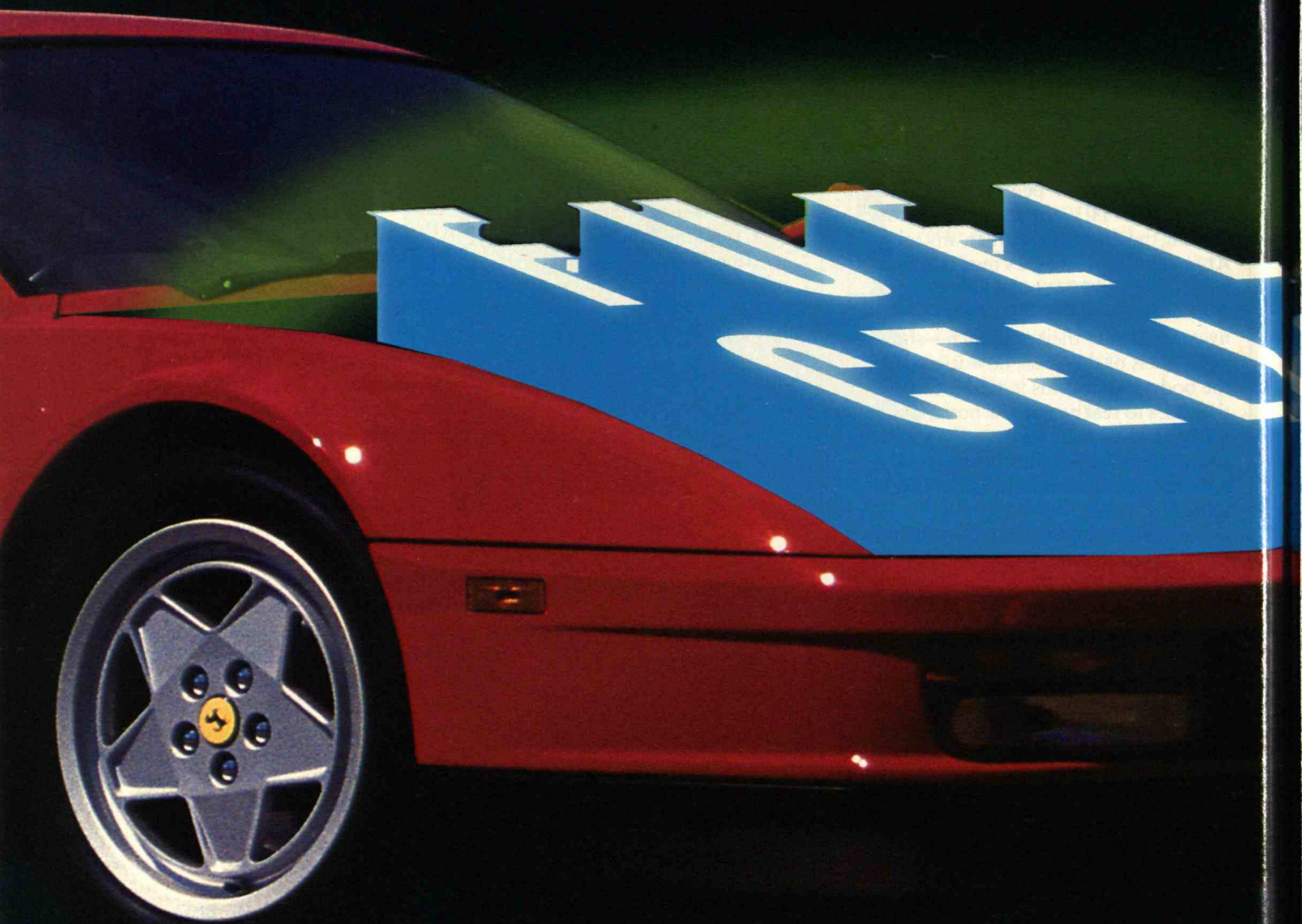


***By*** early in the 21st century,

*fuel cells could do to the internal*

*combustion engine what those engines*


*once did to the horse and buggy.*





BY ROBERT H. WILLIAMS

# The Clean Machine



**T**HE gasoline-powered internal combustion engine, which has dominated personal transportation for three generations, has given us extraordinary mobility. But the technology has also polluted our air, forced us to rely on oil from the politically unstable Middle East, and intensified the long-term threat of global warming. ♦ Fortunately, it now seems possible that within a decade, auto manufacturers could be ready to market a super energy-efficient car that produces virtually no pollution and that can be fueled by a variety of secure energy sources. It would be safe, fun to drive, provide all the amenities of a conventional gasoline car—and cost no more to own and operate than today's cars. ♦ The key technology is the fuel cell. Developed originally as an electric power system for aerospace and military applications, fuel cells have been too costly to consider for cars. But recent technological advances make it possible that mass-produced fuel cells will be able to compete with internal combustion engines in automotive applications. ♦ Fuel cells convert a fuel's energy directly into electricity, without combustion and without moving parts—bringing energy conversion out of the “age of fire” into the “age of

ILLUSTRATION: CONRAD WARRE  
PHOTO: MICHAEL HOWELL / STOCK BOSTON



# Fuel cells convert a fuel's energy directly into electricity, without combustion and without moving parts.

electrochemistry." By removing the intermediate step of combustion, fuel cells would virtually eliminate automotive air pollution and offer a quantum leap in energy efficiency over the internal combustion engine. In fact, fuel-cell cars would be two and a half to three times as efficient as internal combustion engine vehicles.

The electricity generated by a fuel cell drives electric motors, which in turn provide power to the wheels. In this regard, fuel-cell vehicles resemble battery-powered electric cars, which have to date been the focus of efforts to develop a "zero-emission" vehicle. But unlike a battery, which is energized by recharging from a stationary electricity-generating source, the fuel cell generates power from fuel stored onboard the vehicle.

The main features of the fuel-cell system are a fuel supply, an oxidant (typically oxygen from the air), and two electrodes with an electrolyte sandwiched between them. The electrodes are connected through a load (such as an electric motor) by an external circuit. Fuel molecules give up electrons at the anode. The intrinsic tendency of the fuel to react with the oxidant is manifest as a voltage that drives these electrons through the electrical load to the cathode, where they combine with oxygen molecules to form oxygen ions. The electrical circuit is completed by the flow of ions through the electrolyte. The net effect of the reactions at the electrodes is that the fuel and oxidant combine to form water, and, in some types of fuel cells, carbon dioxide as well.

A type of fuel cell that promises to be both compact and inexpensive enough for a practical automobile is the proton-exchange-membrane fuel cell. Offering the potential for long life and low maintenance, this fuel cell was developed for the space program and provided electrical power onboard the Gemini space mission in the 1960s. The ion-conducting electrolyte is a hair-thin polymer membrane. The electrodes are thin sheets of a porous, conductive material, coated with a platinum catalyst, which is needed to speed up the reactions at the fuel cell's low operating temperature of about 200° F. A single membrane/electrode assembly is less than one millimeter thick. A fuel-cell vehicle would use a stack of many such assemblies connected electrically in series. A typical car would need a fuel-cell stack weighing about 125 pounds and occupying 20 to 25 gallons—not much larger than the gasoline tank on a conventional car.

While fuel cells for cars would probably use hydrogen as fuel, the fuel delivered to the car could be either hydrogen or a "hydrogen carrier" that is converted to

hydrogen onboard the car. If hydrogen is delivered to the car, it could be stored in various ways—as a compressed gas (the option favored at present), as a liquid, or as a metal hydride—a compound with a metal that releases the contained hydrogen when heated.

Alternatively, methanol could be used as a hydrogen carrier. Hydrogen would be produced onboard by "reforming" the methanol—reacting it with steam in the presence of a catalyst to produce a gaseous mixture of hydrogen and carbon dioxide, from which the fuel cell would extract the hydrogen fuel. Though a reformer adds complexity to the system, methanol is a liquid fuel that is easier to transport and store than hydrogen.

The relative merits of hydrogen and methanol as well as other potential hydrogen carriers will be the focus of study and debate during the transition to fuel-cell vehicles. Both hydrogen and methanol can be derived from a variety of feedstocks, including natural gas, urban refuse, biomass, and coal. Hydrogen also can be produced from electricity by the electrolysis of water.

## PERFORMANCE AND RANGE

**A**side from cost, the features of the fuel-cell car of greatest interest to the consumer are fuel economy, performance, refueling time, and range between refuelings. Fuel-cell cars operated directly on hydrogen would be three times as energy-efficient as comparable gasoline cars. If operated on methanol, they would be two-and-a-half times as efficient. Fuel-cell cars might therefore be competitive with gasoline vehicles even if the fuel is more expensive, per unit of contained energy, than gasoline—as long as the purchase prices of the fuel-cell cars are not too high.

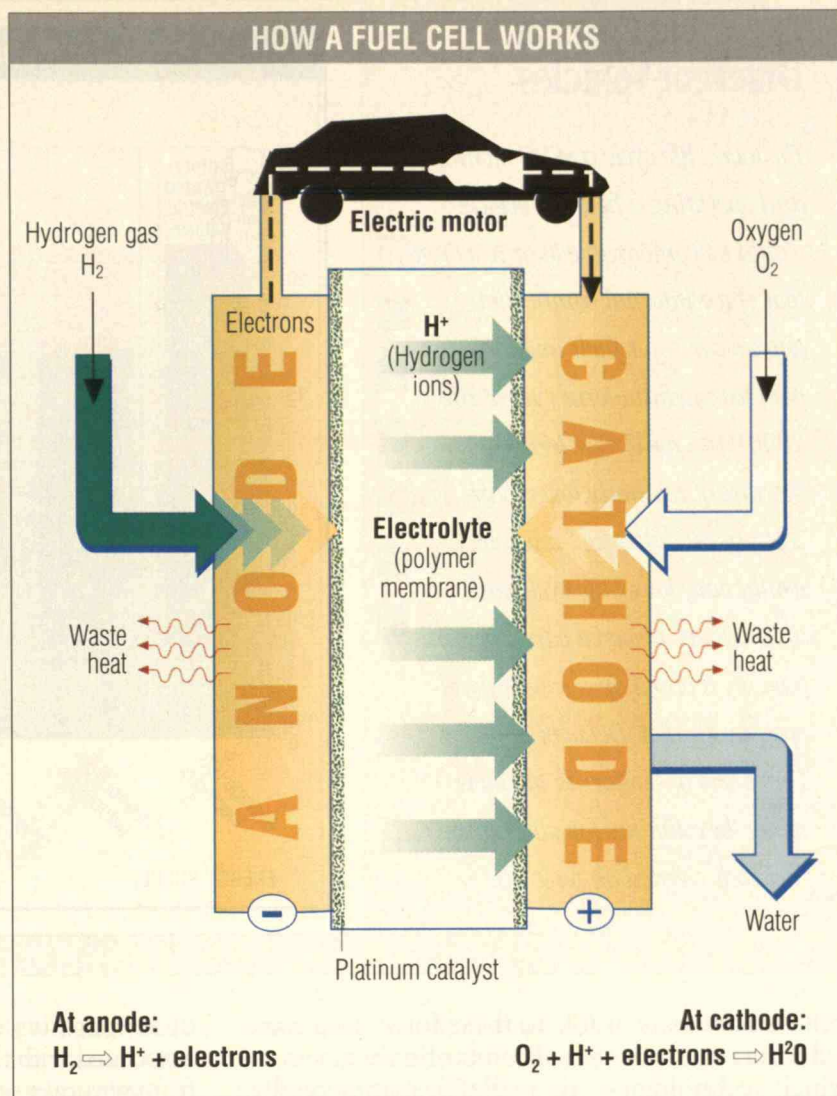
Like their battery-powered technological rivals, fuel-cell cars would be much quieter and require less maintenance than internal combustion engine cars; either type of electric vehicle would have many fewer moving parts than a standard engine, and would avoid the wear-and-tear arising from combustion. The operating life of a proton-membrane fuel cell is likely to exceed that of the rest of the car; it is entirely possible that fuel cells might be removed from retired vehicles and recycled.

A fuel-cell car, like a battery-powered vehicle, would benefit from having an electric instead of a mechanical drive train for delivering power to the wheels. An electric drive can provide higher torque and thus higher power at the lower speeds that characterize most driving. With electric drives there would also be much less lag between application of the pedal and response of the motor. A fuel-cell car might be designed to have somewhat less maximum power than an internal combustion engine car, but maximum power is seldom needed.

*ROBERT H. WILLIAMS is a senior research scientist at the Center for Energy and Environmental Studies at Princeton University. He is coauthor of Renewable Energy: Sources for Fuels and Electricity (Island Press, 1993). A longer version of this article was presented as a paper at the World Car 2001 Conference, held last June in Riverside, California.*



**I**N A PROTON-EXCHANGE-MEMBRANE FUEL CELL, HYDROGEN FUEL'S TENDENCY TO REACT WITH OXYGEN RESULTS IN A VOLTAGE BETWEEN TWO ELECTRODES. AT THE ANODE, HYDROGEN FUEL IS IONIZED. THE VOLTAGE DRIVES THE ELECTRONS RELEASED THROUGH AN EXTERNAL LOAD (IN THIS CASE, THE CAR'S MOTOR) TO THE CATHODE, WHERE THEY COMBINE WITH OXYGEN MOLECULES TO FORM OXYGEN IONS. THE ELECTRICAL CIRCUIT IS COMPLETED BY THE FLOW OF POSITIVE HYDROGEN IONS THROUGH A POLYMER MEMBRANE TO THE CATHODE, WHERE THEY COMBINE WITH THE OXYGEN IONS TO FORM WATER. THE PLATINUM CATALYST SPEEDS UP THE REACTIONS. A CAR WOULD USE A STACK OF MANY MEMBRANE/ELECTRODE ASSEMBLIES.



To provide extra power for starts and passing, a fuel-cell car would probably use some sort of energy storage device, such as a battery, a flywheel, or an “ultra-capacitor”—a capacitor able to hold a large amount of charge in a small volume (substantial research and development on such capacitors was carried out under the Strategic Defense Initiative). The storage device would be charged both by the fuel cell operating under low-load conditions and with the energy that would otherwise be lost in braking, via a “regenerative braking” system. The storage system could be much smaller than the batteries needed for battery-powered electric cars. In one fuel-cell-vehicle design, an advanced battery was chosen that would weigh 280 pounds and occupy 20 gallons.

Like conventional cars, fuel-cell cars can be refueled in only a few minutes at refueling stations—in contrast to the several-hour battery recharging times required for

battery-powered electric cars. The distance a fuel-cell car could travel between refueling would depend on its type of fuel. With methanol as a hydrogen carrier, the range would be about the same as for a gasoline car. That's because while the energy content of a unit volume of methanol is half that of gasoline, the fuel-cell car would be more than twice as efficient.

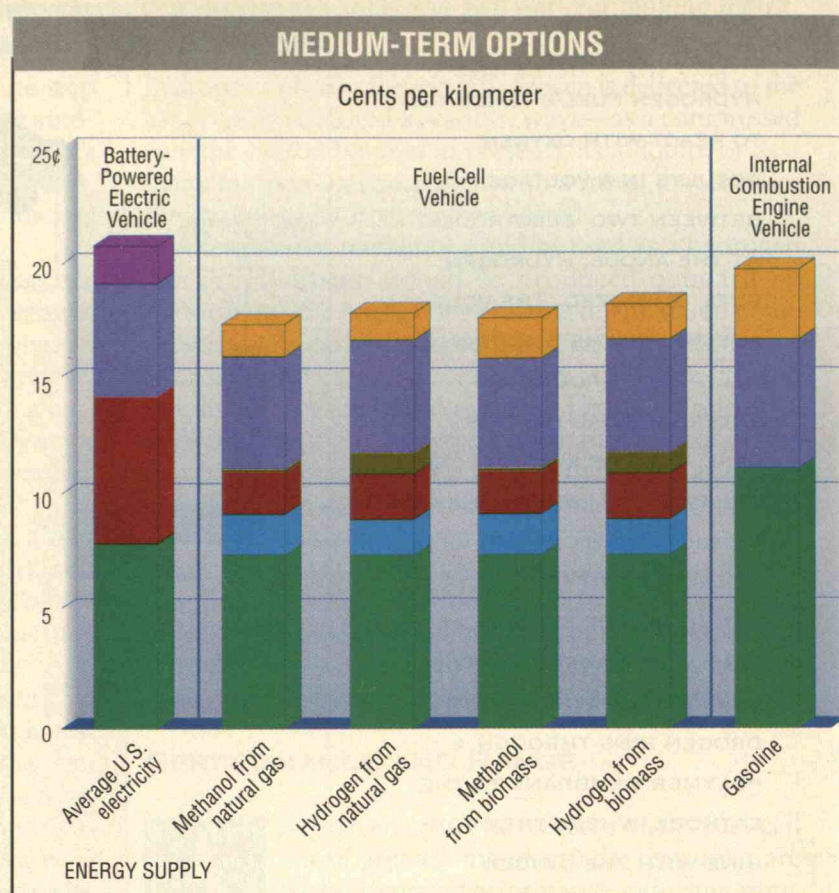
If the stored fuel were gaseous hydrogen, the range between refuelings would be less, because of hydrogen's low energy density. Still, a fuel-cell car with an acceptable range could probably be produced by storing hydrogen at high pressures in canisters made of lightweight, high-strength materials. Enough hydrogen to provide a 250-mile range could be stored at 500 atmospheres in a 35-40 gallon aluminum canister wrapped with carbon fiber; such a canister would weigh only about 180 pounds.

The challenges of storing compressed hydrogen for



## Life Cycle Costs of Different Vehicles

*The total "life cycle cost" of owning and operating a fuel-cell vehicle would be comparable to or less than that of an internal combustion engine car—for fuels available in both the medium term (years 2005-2020) and the longer term—because of relatively low repair costs. In all cases, fuel-cell vehicles would have lower life cycle costs than battery-powered cars. The comparison is based on a model developed by Mark A. DeLuchi at the University of California at Davis, using the estimates for alternative fuel costs charted on page 26.*



fuel-cell cars are comparable to those for storing compressed natural gas for internal combustion engine cars, for which technologies are available commercially. For a given range, the storage volumes are about the same for these options. While hydrogen has only one-third the energy of natural gas per unit volume, this is offset by the fuel-cell vehicle's three-fold greater fuel efficiency.

### A CLEAN AND SAFE MACHINE

**A**utomotive emissions are of two broad types: local pollutants (such as carbon monoxide and oxides of nitrogen) and greenhouse gases (principally carbon dioxide). The fuel-cell car scores well in both categories.

Because it is fueled by hydrogen and operates at a low temperature, the fuel cell used in cars produces only water in operation. If methanol is used as a hydrogen carrier, the only local pollutant emissions from the car are tiny amounts of carbon monoxide and oxides of nitrogen from the operation of the reformer, plus small amounts of evaporative emissions from the fuel tank. The off-vehicle storage, distribution, and transfer of methanol would also result in small amounts

of evaporative emissions. Local pollutant emissions associated with the conversion of methanol or hydrogen from natural gas would be very low.

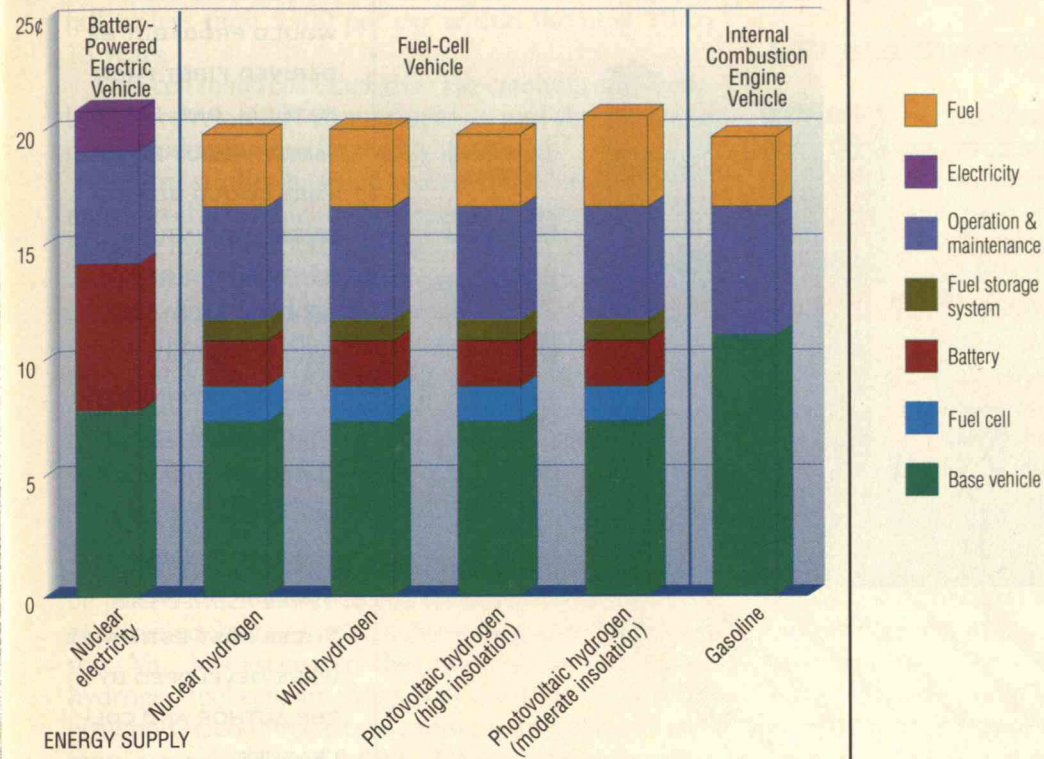
By contrast, total local emissions from the battery-powered electric car system would not be reduced to low levels—at least not in the near term. If battery-powered cars were recharged at night by the average mix of coal and nuclear plants expected in the year 2000, local emissions would be shifted from vehicles to the power plants and transformed in character. While emissions of battery-powered cars are zero and emission of carbon monoxide and volatile organics would be near zero for the power plants supporting them, power-plant emissions of oxides of nitrogen would be one-third larger per mile for battery powered cars than for internal combustion engine cars run on reformulated gasoline. Sulfur dioxide and particulate emissions would also be higher for battery cars than gasoline ones.

Net system-wide release of greenhouse gases—taking into account all emissions associated with primary resource recovery, fuel processing, and use—would also be much less for fuel-cell cars than for the alternatives. If the energy carrier is derived from natural gas, emissions per mile would only be two-fifths as much as for gasoline cars in the case of methanol and one-third as much



## LONG-TERM OPTIONS

Cents per kilometer



in the case of compressed hydrogen. Here again, fuel cells would in the near term be more attractive than battery vehicles. System-wide greenhouse gas emissions for battery-powered cars would be more than half of those for gasoline cars, if the electricity were provided mainly at night by the average mix of coal and nuclear plants expected for the United States in the year 2000.

Fuel-cell vehicles could avoid greenhouse gas emissions almost entirely if they used fuel derived from biomass instead of natural gas. The amount of carbon dioxide released in conversion and use would be exactly offset by carbon dioxide removed from the atmosphere in photosynthesis. Small amounts of greenhouse gases would still be emitted from fossil fuels used in growing, harvesting, and transporting the biomass to the fuel conversion plant, and, in the case of hydrogen, in operating compressors at refueling stations. But these emissions would be less than those for gasoline cars by 90 percent or more. In the long term, greenhouse gas emissions associated with both biofuels production and electricity generation could be reduced to zero, as renewable energy sources come to replace fossil fuels.

Many people think hydrogen is a dangerous fuel. One often-voiced concern is that hydrogen is both flammable and explosive over a much wider range of

concentrations in air than either gasoline or methane. Another is that hydrogen will leak from containment vessels more readily than alternative fuels. These dangers, however, are overstated.

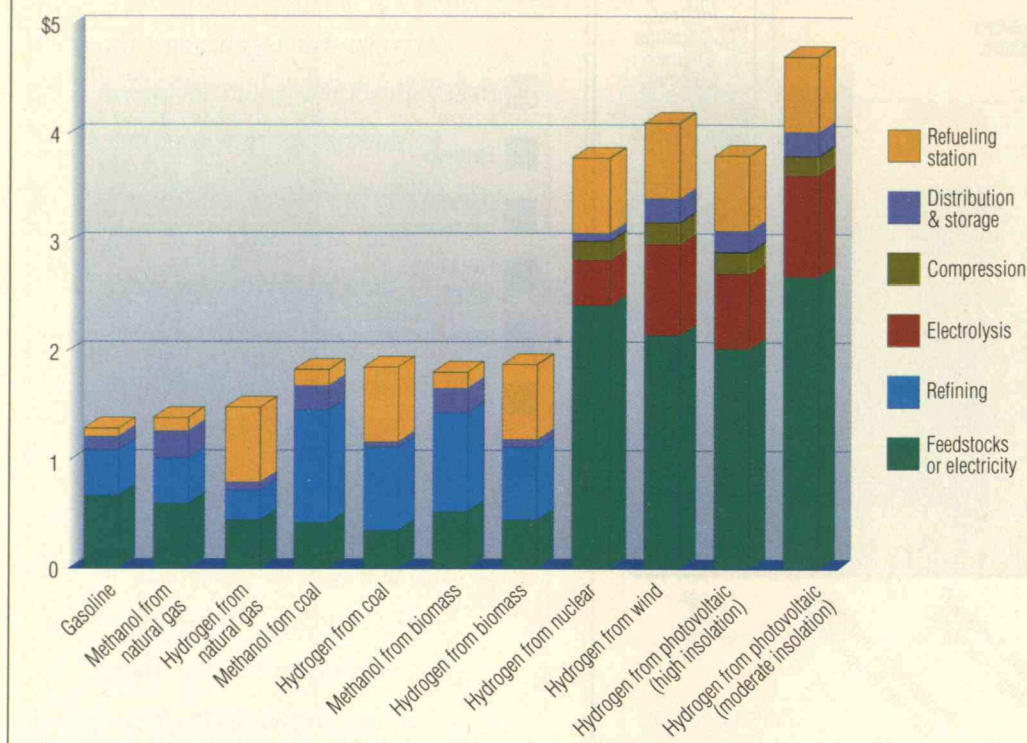
If a combustible gas were to build up gradually through a leak, its lower limits of flammability and detonability would usually be more relevant to safety than the ranges. In this regard, hydrogen is not much different from the alternatives. The lower flammability limit is only marginally lower than for methane and it is significantly higher than for gasoline. Moreover, the lower limit for detonation is much higher for hydrogen than for the alternatives.

The leakage rate of hydrogen through damaged seals or cracked welds is about three times as large as for methane but less than that for gasoline vapors. However, because it is such a buoyant gas, hydrogen leaked out-of-doors would disperse quickly, making it difficult to form a flammable mixture. In contrast, because they are heavier than air, gasoline vapors can linger and pose a longer-lasting risk of fire or explosion. Similarly, gaseous hydrogen released from a ruptured fuel tank outdoors would disperse quickly, while gasoline spilled from a ruptured fuel tank would puddle and pose a lingering threat.



## COSTS OF ALTERNATIVE FUELS

\$ per gallon of gasoline-equivalent



## HYDROGEN AND METHANOL FOR

A FUEL-CELL CAR WOULD PROBABLY BE DERIVED FIRST FROM NATURAL GAS. LATER (AFTER ABOUT 2010), THEY COULD BE PRODUCED AT SIMILAR COST FROM BIOMASS OR COAL. ULTIMATELY, HYDROGEN COULD ALSO BE OBTAINED BY SPLITTING WATER ELECTROLYTICALLY, USING ELECTRICITY FROM RENEWABLE AND NUCLEAR SOURCES. THESE COST ESTIMATES WERE DEVELOPED BY THE AUTHOR AND COLLEAGUES.

The hazards of hydrogen are different from but not greater than those of conventional fuels. All the major energy carriers being considered for transportation, including natural gas, gasoline, and hydrogen, are potentially dangerous and must be handled properly. With appropriate precautions, however, all can be produced, transported, stored, and used safely.

### COMPUTING THE COSTS

**P**rototype fuel cells are expensive, and it will be impossible to accurately estimate the costs for routinely produced fuel-cell cars until engineering designs are more fully developed. Nevertheless, several considerations suggest that fuel-cell cars could be competitive with conventional gasoline automobiles.

Consider first the selling price of the vehicle. If fuel-cell cars were to come into common use, the economies of mass production would determine the price. The cost of a mass-produced product can generally be estimated from the costs of raw materials and of fabricating similar technologies. The only scarce material in the proton-exchange-membrane fuel cell is the platinum catalyst. Until recently, platinum requirements were so high that the cost of this catalyst seemed likely to make it

impossible for fuel cells to compete in automotive markets. But recent advances at the Los Alamos National Laboratory and Texas A&M University have reduced the platinum requirements for this fuel cell by a factor of 40. Since the vehicle will not need a platinum-containing catalytic converter to clean up exhaust, as today's gasoline cars do, the net cost of additional platinum for a fuel-cell car would come to only about \$200, assuming that the platinum loading level already achieved in the laboratory can be achieved routinely in cars.

The only other costly component of a fuel cell is the polymer membrane that serves as the electrolyte. Today's membranes cost several thousand dollars per car. These membranes are not commercial products and are available only in small quantities. But their manufacture does not entail procedures extraordinarily different from those required for a variety of other polymer membranes.

If the membranes were marketed and demand were to increase, the economies of mass production would come into play. Moreover, research and development on alternative membranes would intensify, so that costs would fall as a result of innovation as well as production at high volume. Indeed, experience with polymer membranes (such as Teflon) and many other petrochemical products shows that such products tend to follow clas-



sical experience curves, with costs typically declining 20 percent for each doubling of production. Studies of fuel-cell car costs indicate that membrane costs could fall to less than \$300 per car within the next 10 to 15 years.

Fuel-cell materials other than the catalysts and membrane are relatively commonplace, and their costs in mass production can be readily estimated.

Several studies have estimated the overall costs of mass-producing fuel-cell cars. Mark DeLuchi, of the Institute for Transportation Studies of the University of California at Davis, has projected retail prices for fuel-cell cars that would have attributes similar to those of a year-2000 variant of a gasoline-powered Ford Taurus priced at \$17,300 (1992 dollars). He estimates that a methanol fuel-cell car would sell for \$22,500 and a hydrogen fuel-cell car for \$24,000—in both cases less than his estimate of \$27,000 for a battery-powered electric car with the same 250-mile range as for the hydrogen fuel-cell car.

Other analyses suggest that fuel-cell vehicles could be priced much closer to conventional cars. Ira Kuhn of Directed Technologies, a consulting firm in Arlington, Va., has estimated that the cost for a gaseous hydrogen fuel cell, an energy storage device to provide peak power, compressed gas canisters, and all auxiliaries would total about \$4,000. Taking into account a \$3,000–4,000 credit for the internal combustion engine equipment displaced, including the mechanical drive train and emissions control system, the incremental cost of the fuel-cell vehicle would be no more than \$1,000. A recent study by a major U.S. automobile manufacturer for the Department of Energy came to a similar conclusion—that in mass production, fuel-cell cars would cost little more to build than gasoline cars.

A fuel-cell vehicle would be relatively inexpensive to operate because of reduced maintenance requirements and higher fuel efficiency. For natural gas prices expected near the turn of the century, the pump prices for methanol and hydrogen, per unit of contained energy, would be slightly higher than for gasoline derived from \$25-a-barrel crude oil. Yet because of the higher energy efficiency of fuel-cell cars, the fuel cost per mile would be less than half that for gasoline cars. Biomass-derived hydrogen and methanol would be more costly—perhaps as much as 50 percent more expensive than gasoline at the pump, on an energy-equivalent basis. Nevertheless, the fuel cost per mile would still be less than 60 percent that of gasoline cars.

If initial costs prove to be comparable and operating costs are lower for the fuel-cell car, lifecycle costs (the total costs of owning and operating the vehicles, in cents per mile) of fuel-cell cars would be markedly less than for internal combustion engine cars. But even if first costs prove to be substantially higher, as estimated by

DeLuchi, fuel-cell cars could still be competitive on a lifecycle-cost basis when powered by fuel derived from natural gas and biomass.

## A FUELS STRATEGY

**T**he introduction of fuel-cell cars must be coordinated with a strategy for developing the necessary fuels. Initially, both methanol and hydrogen would be derived mainly from natural gas. This process would entail no new technologies; methanol and hydrogen are today routinely produced from natural gas for chemical markets.

Methanol, because it is a liquid fuel that is easy to transport by ship, would be produced primarily from low-cost supplies of foreign natural gas. Hydrogen would be produced mainly from domestic natural gas. Initially, facilities for converting natural gas into hydrogen could be located at or near automobile refueling stations; such siting would make it possible to launch fuel-cell vehicle technology without first having to create an infrastructure for the long-distance transmission of hydrogen gas.

Fuel-cell cars would be so energy efficient that overall primary energy requirements would be much less than for gasoline cars, despite the conversion losses in manufacturing the fuels. For example, if in the year 2010 all cars and light trucks in the United States were powered by fuel cells, the fleet could be supported with hydrogen derived from natural gas equivalent to 3 million barrels of oil per day—less than two-fifths of the oil that these vehicles would use if equipped with internal combustion engines, according to Department of Energy projections.

As natural gas supplies tighten and prices rise, additional supplies of methanol and hydrogen could be obtained from other sources. Both can be produced from coal or biomass using thermochemical processes that begin with gasification. The products of gasification, which include carbon monoxide, hydrogen, and methane, can be converted into methanol or hydrogen using well-established technologies. While most gasification efforts have focused on coal, biomass is far more reactive than coal and thus easier to gasify; it also contains very little sulfur. And biomass facilities would present fewer financial risks since they could be built in relatively small units; a \$200 million biomass plant could produce hydrogen about as economically as a \$900 million coal facility, even if the biomass feedstock is considerably more costly than coal.

In light of prospective comparable fuel production costs with coal and biomass feedstocks but major environmental advantages for biomass, biomass would be favored as long as supplies are adequate. If powered by



## **F**uel-cell cars would be two and a half to three times as efficient as internal combustion engine vehicles.

fuel cells, the year 2010 fleet of cars and light trucks could be supported with hydrogen derived from biomass grown on about 70 million acres—the amount of cropland currently held out of agricultural production in the United States to support agricultural crop prices and to control erosion. Growing biomass for energy on such excess croplands would provide an alternative livelihood for farmers and might even make it possible, eventually, to phase out agricultural subsidies.

Even waste resources now regarded as “minor” could make significant contributions to fueling these new vehicles, based on the use of essentially the same technologies that would be used to make methanol or hydrogen from biomass. Enough hydrogen could be derived from urban wood wastes and from the municipal solid waste left after an ambitious recycling program, for example, to support up to one-quarter of the car and light truck fleet in 2010. The conversion processes are far less polluting than incinerators, and the production of fuel-cell fuels from these wastes could provide major new income streams for urban areas.

Eventually, when such waste resources are fully utilized and as land for expanding biomass production becomes scarce, large additional quantities of hydrogen could be produced by splitting water electrolytically—using electricity generated by wind, photovoltaic, or other renewable sources. No air pollution or greenhouse gas emissions would be associated with the production or use of hydrogen from these sources, and potential supplies are vast. Wind farms on 6 percent of the land area of the Great Plains states, where the best U.S. wind energy resource can be found, could provide enough hydrogen to support an entire U.S. fleet of fuel-cell cars and light trucks at the level of driving projected in 2010. Because the wind turbines and related structures would occupy less than 5 percent of the actual area of a farm, the land could be used simultaneously for ranching, farming, or growing biomass energy crops. Photovoltaic modules on 0.1 percent of the U.S. land area could similarly provide enough hydrogen to support this fleet.

Electrolytic hydrogen will probably not be cheap. Even if solar- and wind-generated electricity become as inexpensive by the year 2010 as renewable energy analysts predict, the pump price of electrolytic hydrogen would be about twice that for hydrogen or methanol derived from biomass, and three times that for gasoline. Nevertheless, fuel-cell cars would be so energy-efficient that fuel would account for less than 20 percent of the total lifecycle cost of owning and operating the vehicle, even when powered with wind or photovoltaic hydrogen. Thus the price of fuel will not be a major determinant of the economics of fuel-cell cars. In fact, the lifecycle cost for a fuel-cell car powered with electrolytic hydrogen is likely to be only a few percent

higher than that of a gasoline car, and less than that of a battery-powered electric car.

### **PLANNING THE TRANSITION**

**B**ecause the problems posed by today's automobile are shared by much of the rest of the world, the United States could gain a competitive edge by developing fuel-cell cars first. However, planners cannot assume that the rest of the world will idly await U.S. technology. Programs to develop fuel-cell cars are already under way in other countries. Notably, Ballard Power Systems of Vancouver, Canada, has built and field-tested a 30-foot bus, powered with hydrogen and proton-exchange-membrane fuel-cells, with support from the Province of British Columbia and the Canadian government. Ballard has also entered into a four-year, \$35 million joint venture with German automaker Daimler-Benz to develop a compact proton-exchange-membrane fuel cell stack for automobiles.

Serious pursuit of the fuel-cell car option will require a major redirection of U.S. automotive R&D. So far only modest public resources have been committed to the relevant technologies. The Department of Energy's budget for R&D on fuel cells for transportation totaled just \$12 million in 1993, while that for hydrogen energy amounted to \$4 million and funding for biomass energy crops \$4.5 million—in all, just 0.7 percent of DOE's total budget for research, development, and demonstration of energy-supply technologies.

These budgets do represent increases compared with past efforts, and some noteworthy programs have been launched. DOE is funding General Motors to build, by 1996, a methanol fuel-cell “proof-of-concept” car that will subsequently be field-tested for two years. DOE is planning a parallel effort to develop fuel-cell cars with onboard hydrogen storage. If these embryonic programs were transformed into a more aggressive commercialization effort, fuel-cell cars could be ready for use in large automobile fleets shortly after the turn of the century, and could be mass produced for general use before 2010.

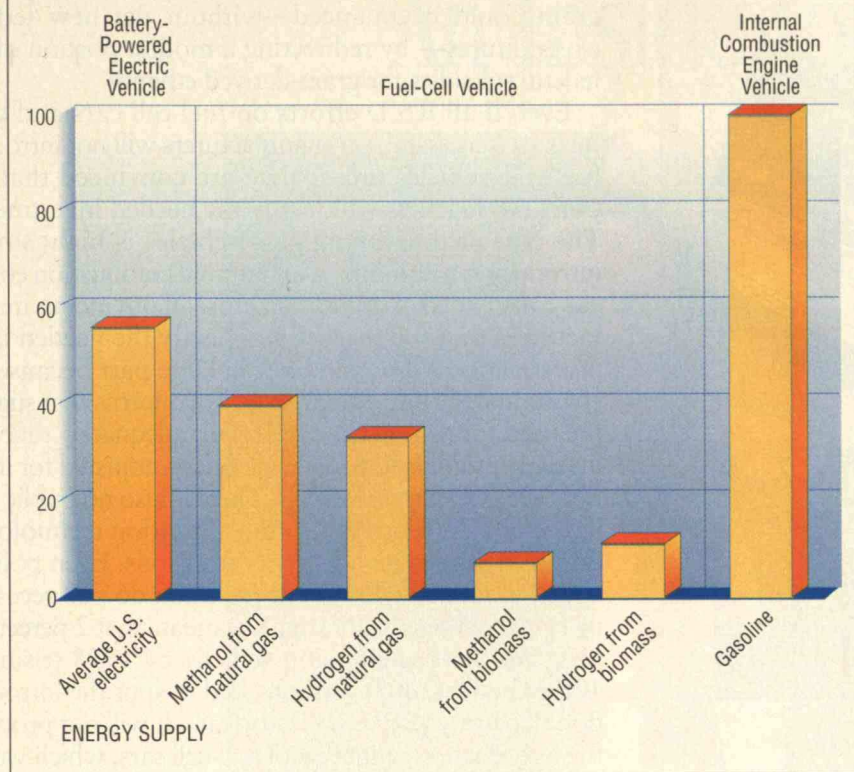
A policy framework that could help focus such an effort is the Initiative for a New Generation of Vehicles, launched last September as a partnership between the Clinton administration and U.S. automakers to pursue radical automotive technologies. The initiative's goal is to develop and bring to market an automobile with the size, cost, safety, and performance of today's cars but with up to triple the fuel economy, very low pollutant emissions, the ability to operate on fuels other than petroleum—particularly from renewable resources—and substantially reduced greenhouse gas emissions.

While the government has spelled out the criteria the



## GREENHOUSE GAS EMISSIONS

Relative to gasoline car (= 100%)



**I**N THE MEDIUM TERM, THE ENERGY SYSTEM SUPPORTING FUEL-CELL VEHICLES—including FUEL RECOVERY, PROCESSING, AND USE—WOULD PRODUCE SUBSTANTIALLY LOWER AMOUNTS OF GREENHOUSE GAS EMISSIONS THAN THAT SUPPORTING GASOLINE CARS OR BATTERY CARS. FOR ELECTROLYTIC HYDROGEN, WHICH MIGHT BE USED IN THE LONG TERM, GREENHOUSE EMISSIONS WOULD BE ESSENTIALLY ZERO.

future car should satisfy, the technological choices will be made by industry. The initiative is not aimed specifically at advancing fuel-cell cars, and for the first few years, at least, several technological paths will probably be pursued in parallel. Because the criteria are so daunting, however, the fuel-cell car is likely to emerge early on as a leading candidate.

Under the agreement, automakers would develop various proof-of-concept vehicles during the 1990s and strive to provide production-ready prototype vehicles that would meet these objectives in roughly a decade's time and, in the interim, improve existing cars with advanced technologies and manufacturing methods as they become commercially ready. As a "peace dividend," the government would make available to U.S. auto producers extensive technological resources of its military and aerospace programs. The car companies would therefore have access, for example, to extremely strong, light-weight materials developed for advanced weapons systems, ultracapacitors from Star Wars projects, fuel cells and super-efficient motors from the Advanced Research Projects Agency, and computer-simulation systems for design and prototyping from the Army Tank Command.

The government's contribution would be financed by redirecting some military research and development programs to the initiative. The government has pledged

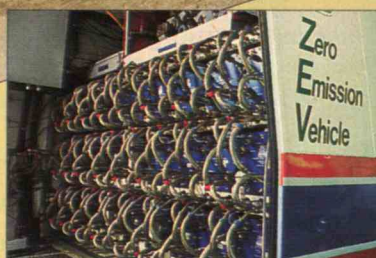
to use the power of federal procurement to support the goals of the initiative, and to encourage state governments and other groups to take similar actions as advanced technologies approach commercial readiness.

If the promise of the fuel-cell car is borne out by additional R&D, industry and government participants in the initiative would have to make a political decision to launch a concerted effort to introduce fuel cell cars and their fuels, and to build the related infrastructure. An evolutionary strategy for providing fuels suitable for use in fuel-cell cars would have to be developed. The oil and gas industries could begin to produce methanol or hydrogen derived from natural gas and to build the needed infrastructure, once a political decision is made to introduce such a new energy carrier. Efforts based on the use of natural gas for the near term should be complemented by efforts aimed at eventual commercialization of fuels derived from alternative sources, such as biomass.

Biomass is already used as a transport fuel; about 1 billion gallons of ethanol are produced in the United States annually from grain for use in "gasohol." Federal subsidies to producers of grain ethanol cost the taxpayer more than \$500 million per year. Without this subsidy, grain ethanol would not be economical as fuel—and may never be. The Department of Energy also funds R&D on technology for producing ethanol



**W**ind farms on 6 percent of the land area of the Great Plains states could produce enough hydrogen from water to support an entire U.S. fleet of fuel-cell vehicles.



**A** 20-PASSENGER PROTOTYPE OF A FUEL-CELL BUS BUILT BY BALLARD POWER SYSTEMS TRAVELS ABOUT 100 MILES BEFORE ITS TANKS OF COMPRESSED HYDROGEN FUEL NEED REFILLING. HYDROGEN AND AIR FLOW THROUGH EACH OF THE BUS'S 24 FUEL-CELL "STACKS" (SEE INSET), WHICH TOGETHER PROVIDE 160 HORSE-POWER. BALLARD AIMS TO OFFER A 75-PASSENGER COMMERCIAL VERSION OF THE BUS, WITH A RANGE OF 350 MILES, BY 1998.

from low-cost woody feedstocks. Ethanol from such sources might eventually be competitive with gasoline for internal combustion engines.

But ethanol is not a strong candidate fuel for use with the proton-exchange-membrane fuel cell because it requires much higher temperatures to reform than methanol. A fuel-cell program would therefore benefit from much more ambitious and diversified biofuels development, focusing on methanol and hydrogen as well as ethanol, and giving much more emphasis to potentially low-cost biomass feedstocks such as fast-growing trees and perennial grasses. A substantial pro-

gram could be financed—without net new federal expenditures—by redirecting a modest portion of the federal subsidies for grain-derived ethanol.

Even if all R&D efforts on fuel cell cars and their fuels are successful, car manufacturers will not introduce fuel-cell vehicles unless they are convinced that the potential markets will justify the needed investments. The cost of developing new vehicles is high; simply introducing a new line of an internal combustion engine car can cost \$1–2 billion or more. Convincing manufacturers that the market will justify the needed large investments will not be easy, in large part because the environmental and energy-security concerns that suggest the need for radical change are not adequately reflected in market signals. U.S. gasoline prices, adjusted for inflation, are at record low levels. There is also no public policy offering incentives for transportation technologies that have low greenhouse gas emissions. Even policies aimed at reducing urban air pollution do not necessarily favor fuel cells. California's mandate that 2 percent of new cars be zero-emission vehicles by 1998 (rising to 10 percent by 2003) was intended to spur the introduction of battery-powered electric cars. It will not promote the introduction of methanol fuel-cell cars, which would have very low, but not zero, emissions.

To help create markets for fuel-cell cars, policymakers must ensure that the auto industry is not so burdened by complex environmental or other regulations that companies fritter away scarce R&D resources on expensive Band-Aids such as costly tailpipe emissions cleanup systems or new automotive technologies that do not make significant contributions toward solving the long-run environmental and energy-security problems posed by the automobile. To this end, all regulations and other programs relating to the automobile should be reexamined to ensure that they are adequately supportive of the goals of the initiative for a new generation of vehicles.

A successful program aimed at commercializing fuel cells and their fuels for transportation will require effective leadership from the Clinton administration. The president and vice-president must use the bully pulpit to convince the public that such an automotive venture is as important to our future as putting a man on the moon. The administration must provide firm leadership in guiding through Congress whatever legislation will be needed, and be prepared for occasional "jaw-boning" with industrial leaders, which can often be as effective as formal policy signals sent through regulations. The administration must persuade all concerned that it is committed to restoring the technological preeminence of the nation's automobile producers and to removing the automobile from the list of the nation's environmental and energy-security problems. ■



# Reforming the Pentagon: An Inside Job



## *AN INTERVIEW WITH JOHN M. DEUTCH*

**A CONSUMMATE ACADEMIC-CUM-POLICYMAKER STRUGGLES  
TO CHANGE THE DEFENSE COLOSSUS.**

ONE of John Deutch's first official decisions in the Department of Defense last spring was to change his title. The position he came to Washington to fill in the early weeks of the Clinton administration was undersecretary of defense for acquisition. He quickly crowned himself undersecretary of defense for acquisition *and technology*. It was a fitting change, for Deutch is hardly the glorified purchasing agent that



the shorter title implied. A physical chemist and an Institute Professor at MIT, he earned a reputation as a stern but broad-minded administrator during an earlier stint as the institute's provost and dean of science.

Deutch's responsibilities at the Pentagon put him near the epicenter of the seismic shift in resources occurring as the United States attempts to rethink security in a new era. Deutch is wrestling with how to bring the Department of Defense into a world with a radically diminished nuclear threat, a world wherein national security derives as much from economic strength as from military might. The *New York Times* has called the sometimes tough-talking Deutch, who has responsibility for some \$100 billion in defense spending, a "gathering force of one" in the Pentagon's sometimes painful readjustment to a world without the Soviet Union.

The Belgian-born Deutch, 55, is no stranger to the federal government: he has come and gone for three decades with the tides of Democratic administrations. In the early 1960s he came to the Pentagon as a systems analyst, one of Robert McNamara's "whiz kids." He joined the MIT chemistry faculty in 1970 but returned to Washington during the Carter years, serving as under-secretary for research at the new Department of Energy while the nation rode out oil shocks and nuclear mishaps.

Deutch evinces little patience with the glacial pace of progress in the nation's capital. The Clinton administration's stumbling start last spring delayed his appointment to the DOD post even after it had been unofficially announced. Frustrated, Deutch said he would turn the job down unless it was officially offered within two weeks. He didn't have to make good on the threat. And as the Pentagon leadership churns in the wake of Secretary Les Aspin's resignation, Deutch's star is on the rise. He was President Clinton's choice to be deputy secretary of defense, filling the vacancy left by Aspin successor William Perry.

*Technology Review* senior editor Herb Brody recently interviewed Deutch at his office in the Pentagon. With military helicopters roaring past the window every few minutes, Deutch discussed the changes under way in his new domain.

TR: What should government be doing to smooth the conversion of military facilities to civilian purposes?

DEUTCH: We prefer the word "reinvestment."

TR: What's the distinction?

DEUTCH: The government is not especially well equipped to convert specific companies or specific groups of workers from national defense work to civilian work. Rather, we must focus on the investment activities of the Department of Defense that can lead to new opportunities in the economy for people and for businesses—but not necessarily by selecting the specific businesses that have been affected by reductions in defense spending.

TR: What sort of investments are you talking about?

DEUTCH: Three types. One is with respect to people—men and women who formerly served in the armed forces or worked for the defense industry. We invest in these people by providing them with things like job-retraining programs, severance pay, and information about job opportunities and vocational opportunities, the idea being to reinvest these human resources of the country into new activities. The second kind of investment has to do with facilities. What happens to closed bases, for example, or unneeded technical laboratories or equipment. This is reinvestment of capital assets. The third part of investment has to do with technology. We do not speak of "converting" swords into plowshares. Rather, we are looking at the common technologies that can be used to make both swords and plowshares more efficiently and at lower cost. The emphasis is on applying these "dual-use" technologies to both commercial and military purposes to help the country create jobs and improve economic growth.

TR: Are your investment efforts hampered by barriers of corporate culture? After all, the aerospace and defense industries are not accustomed to private-sector markets.

DEUTCH: That's correct—and there's no reason to assume that large, traditional defense contractors are the best vehicles for creating these new dual-use technologies. We don't exclude them, but we want to open this opportunity to all companies, including commercial ones. Some defense companies, like Raytheon, also have extensive commercial operations. Others, like Martin Marietta, do not. But in general, our view is much more inclusive than the traditional defense companies. That's why we talk about reinvestment and not conversion.

TR: What technologies in particular do you see as having common value for both civilian

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and military purposes?

**DEUTCH:** The key technologies that underlie large parts of both the military and the commercial sectors are materials, information technology—particularly software and software-engineering tools—and advanced microelectronics, such as gallium-arsenide circuits. These technologies are fundamental to creating efficiencies in the commercial sector and creating capacity in the defense sector. Federal investment in these technologies would bring advantages to both.

**TR:** What about the objection that the market makes wiser choices than the government in choosing which technologies to develop?

**DEUTCH:** There are those who say that the government is not good at picking winners. I don't believe that's quite right. What I like to say it is that losers know how to pick the government.

**TR:** How might the government avoid being a target for "losers"?

**DEUTCH:** Government can minimize the risk in two ways: by involving industry in formulating programs, and by asking industry to share the costs of technology development.

**TR:** The "information highway" that's on everyone's lips owes much to the computer network technology developed for ARPANET in the 1950s and 60s. Is there anything that's going on right now in military technology that you see as having such seminal value?

**DEUTCH:** Yes—computer simulation. Its integration across all aspects of product development—computer-assisted design, engineering, and manufacturing—has the potential to be as revolutionary to industry as the ARPANET and packet switching have been to telecommunications.

#### TRANSFORMING PROCUREMENT

**TR:** What parts of the defense acquisition system are broken and need to be fixed?

**DEUTCH:** Well, I can't think of anything about



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the defense acquisition system that *isn't* broken. It's very cumbersome and expensive. An extraordinarily long time elapses before an idea gets executed in the field. And it is full of rules that are intended to stop abuse but that in fact only make matters more costly.

**TR:** For instance?

**DEUTCH:** During the Gulf War, the Department of Defense wanted to buy mobile radios. The best mobile radio available was a commercial product from Motorola. But the rules require that before DOD buys a commercial item, the contractor must have in place a government-approved system of

cost-accounting to justify the selling price to the government. Motorola did not have such a process in place. It was selling a commercial item. The company said: Buy it for this price or go somewhere else. And the government—remember, this is in time of war—the government wouldn't bend. So what happens? Japan buys these radios and donates them to the United States. There used to be good reasons why those regulations were in place, but we have now reached a point where they have become folly.

**TR:** But isn't the military changing the way it does business as it gets smaller?

**DEUTCH:** The defense procurement system was designed for a different world—a world of large-scale systems and defense-unique items. That system is not designed to deal with the problems that the department faces today. We can no longer afford a defense-unique industrial base, where there are high unit costs and small production runs of items built to military specifications. Also, as the defense budget goes down, the amount of money available for procurement is more than proportionally reduced. That's because we are putting more attention into "readiness"—that is, training and current operations—leaving less available for R&D and procurement.

**TR:** So what's your solution?

**DEUTCH:** We must make more extensive use of lower-cost commercial products and services.

**TR:** Do you mean that the military should be



buying more things off the shelf?

**DEUTCH:** I mean it should be buying them commercially. In some cases that means off the shelf. The key point is that the DOD ought to behave more as if it were just another buyer in the marketplace. That means that we'll have the advantage of larger production runs and lower unit costs, and we'll have a more efficient system. Incidentally, this would strengthen the U.S. commercial sector and enhance our industries' ability to compete internationally.

**TR:** Won't this disrupt longstanding relationships between the Pentagon and suppliers of specialized military equipment?

**DEUTCH:** That relationship will remain where we have unique needs, such as submarines, nuclear weapons, high-performance aircraft, tanks, and ammunition. There is a long list of DOD systems that are unique. But more than 50 percent of what we buy are items where there's no need to have special military specifications—things like clothes, food, fuel, cars. A large amount of the electronics and software we buy could be commercial as well.

**TR:** What barriers do you see impeding this change?

**DEUTCH:** The shift will be difficult for three reasons—one of them legitimate, the other two not legitimate. One is the cultural habit of doing business a certain way, with a certain supplier. That's true everywhere, the Department of Defense included—but in times of change that has to be overcome. There is also a congressional interest; the DOD has been a good customer for companies in a great many congressional districts, so members of Congress don't want to see changes that will shift jobs out of their districts. This is an understandable concern but not of general benefit to the nation.

**TR:** What's the legitimate reason?

**DEUTCH:** The way the government has bought items in the past has often been used as an instrument of social change. Buying from small businesses, buying from minority-owned businesses, buying from businesses that give special



preferences to veterans—a whole series of restrictions have been put in place so that the government procurement process is, in part, an important and progressive instrument of change. When you say you want the Department of Defense to behave more like a normal commercial buyer in the marketplace, that role will end.

## CHANGING THE NATIONAL LAB LINEUP

**TR:** Some have questioned the continuing need for the large national laboratories, which were originally set up to develop nuclear weapons. What role do you see labs like these playing?

**DEUTCH:** The national laboratories have a long and distinguished history of producing technology of the highest quality. What we're looking for today, however, is greater efficiency in applying our technology to low-cost manufacturing of items such as electronic circuits, with the possibility of both commercial and military use. This calls for attention to developing and manufacturing commercial products, and that has not been the great strength of the national laboratories. Yet these labs, as well as universities, can play a supporting role in developing dual-use technology—though most of the work will have to be done by industry.

**TR:** Do you think it makes sense to convert the national labs in part to for-hire contract research organizations?

**DEUTCH:** I don't know that we have to do that. If there is a need for contract research, there may be existing mechanisms to fulfill that need. There are many competent R&D service companies in the private sector.

**TR:** So if the national labs are not particularly suited to dual-use technology development or to contract R&D, what *should* they be doing? Or should they be eliminated altogether?

**DEUTCH:** The labs should focus on their core missions: technology bearing on nuclear weapons, including environmental cleanup and counter-proliferation; energy technologies and associated environmental technology; and basic science and technology. Collaborative work

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with industry is especially appropriate in the energy technology area.

**TR:** I understand that before coming to DOD, you criticized the department for allocating a growing portion of research funding to in-house labs, such as those run by the Army, Navy, and Air Force.

**DEUTCH:** Yes. I have made very clear that I believe it is necessary to downsize the government's in-house laboratories. But I'm talking here about the government-owned, government operated, or GOGO, laboratories run by the military services and by numerous other federal agencies. The government-owned, contractor-operated, or GOCO, model, as typified by the large DOE facilities such as Los Alamos, Sandia, and Lawrence Livermore, is much more efficient from the technical point of view, and better serves the needs of the country generally.

**TR:** What's wrong with the government's in-house labs? What makes them less efficient than the contractor-operated facilities?

**DEUTCH:** Contractor-operated labs have more flexibility in personnel and procurement practices; such flexibility is especially important for a technical operation. The contractor-operated facilities are also more insulated from special interests, which often attempt to influence program direction. The Department of Defense is therefore going to allocate a larger fraction of its research and technology dollars out-of-house. Senior technical officials, both uniformed and civilian, agree with this approach. There's no question that some of these in-house laboratories will be considered candidates for closure. At the same time, we will work to strengthen the in-house DOD laboratories that remain. My responsibility is to ensure that a scrupulously fair process is in place to evaluate which technical facilities will be needed and which will be closed.

#### FROM LEMON TO LEMONADE

**TR:** The previous administrations sought to build an ambitious missile-defense system. Even though the Strategic Defense Initiative is gone, much of the same work appears to be continuing under the name of ballistic-missile defense. What has changed?

**DEUTCH:** First of all, the programmed amount of money under President Bush's budget was \$39

billion over a five-year period. The amount of money we are programming over a five-year period is \$18 billion. That \$21 billion difference is a huge amount of money—it represents the GNP of many countries in the world. The second change is a vastly different emphasis. We're concentrating not so much on defending the United States against ballistic missiles but rather on theater missile defense for use as part of our protection of NATO and Japan. Some of these countries face a clear and present danger.

**TR:** How is the system itself different from what was envisioned for Star Wars?

**DEUTCH:** We no longer pay any attention at all to weapons in space, which were a big part of SDI. There are no more lasers in space, no nuclear weapons in space, no "brilliant pebbles"—that's all gone. We do, however, include space-based sensors—the "brilliant eyes" program, for example, is part of a long-term strategy for dealing with theater warning.

**TR:** What threats would such a theater missile defense protect against?

**DEUTCH:** There are several examples, depending on which country you ask. If you ask the French, they're worried about Scud missiles from Libya, and potentially Algeria. If you ask leaders in Turkey, they're worried about Iraq and Iran. If you ask the Japanese, they are concerned about the Long March missiles of China and North Korea.

**TR:** It sounds as if the emphasis has shifted toward defense against conventional as well as nuclear weapons. Some might see this as a way to perpetuate the program despite the virtual disappearance of its original reason for existence—a long-range nuclear threat to the United States.

**DEUTCH:** The change in emphasis is really from intercontinental to theater-range threats. Theater-range missiles can carry conventional ordnance or bacteriological, chemical, or nuclear payloads.

**TR:** You recently tried to persuade the Japanese to cooperate in developing missile defense systems. Why?

**DEUTCH:** The traditional way that the United States and Japan have collaborated on defense is that we permitted Japan to purchase finished

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weapons systems from us. I, along with William Perry—then deputy defense secretary and now President Clinton's choice for secretary of defense—decided to offer the Japanese a different avenue, based on technology cooperation. We would let Japan participate more in developing our defense technology—in theater ballistic-missile defense, for example. In exchange, Japan would provide participating U.S. companies with dual-use technologies that would be of value to us. In particular, we would want access to Japanese expertise on manufacturing and process engineering.

TR: Had Japan asked for our missile-defense technology?

DEUTCH: There's no question about the Japanese interest in theater ballistic missile defense. They have a significant security problem. Eastern Russia, China, and, most definitely, North Korea are matters of both short-term and long-term concern. Theater ballistic-missile surveillance and defense are subjects high on Japan's agenda.

TR: Is this to be a government-to-government agreement, or would it be between individual companies?

DEUTCH: You have to be careful, because when you say something like "government to government," that has a different meaning to the Japanese. The governments will set a framework, but ultimately the exchanges are going to be executed by the participating U.S. and Japanese companies.

TR: What's the status of the proposal?

DEUTCH: It's under consideration by the Japanese. This is quite a different approach and I think it's going to take some time. It may be a year before we know exactly how the exchange will work.

TR: Do you expect the recent weakening of the Japanese economy to affect that country's interest in this proposal?



DEUTCH: The Japanese spend a small proportion of their GNP on defense, so the weakness is unlikely to signal any significant reduction.

#### THE PENTAGON AS PARAGON

TR: In general, how willing have you found the defense bureaucracy to change its ways of doing business?

DEUTCH: I've been pleasantly surprised to find that the uniformed military is willing to embrace dramatic changes. They realize that the Department of Defense must broaden its view of its role in the new

world to include the interaction of national and economic security. Greater reliance on the commercial sector for goods and services is an element of that interaction.

TR: Are these changes related to Vice-President Gore's moves to "reinvent government"?

DEUTCH: Absolutely. Gore's procurement-reform initiative is heavily influenced and motivated by the same irrationalities and inefficiencies that we're talking about in DOD acquisitions—the case I mentioned earlier of how hard it was to buy a commercial radio during the Gulf War is one of the vice-president's favorite examples. But Gore frequently uses the Department of Defense as an example of an agency that has undertaken initiatives to solve its problems. I know of no other government agency that has a plan for reform as comprehensive as that produced by former Secretary Aspin's "bottom-up review"; the plan is a complete roadmap of the new way of doing business for every aspect of the department, including lower force levels, reoriented modernization programs, and changed management practices at, for example, depots and labs.

TR: One doesn't usually think of the Pentagon as a model of efficiency and reform.

DEUTCH: By comparison to other government agencies, it doesn't do so badly. ■

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# MITnews

FROM THE ASSOCIATION OF ALUMNI AND ALUMNAE OF MIT APRIL 1994

## The Side of the Angels

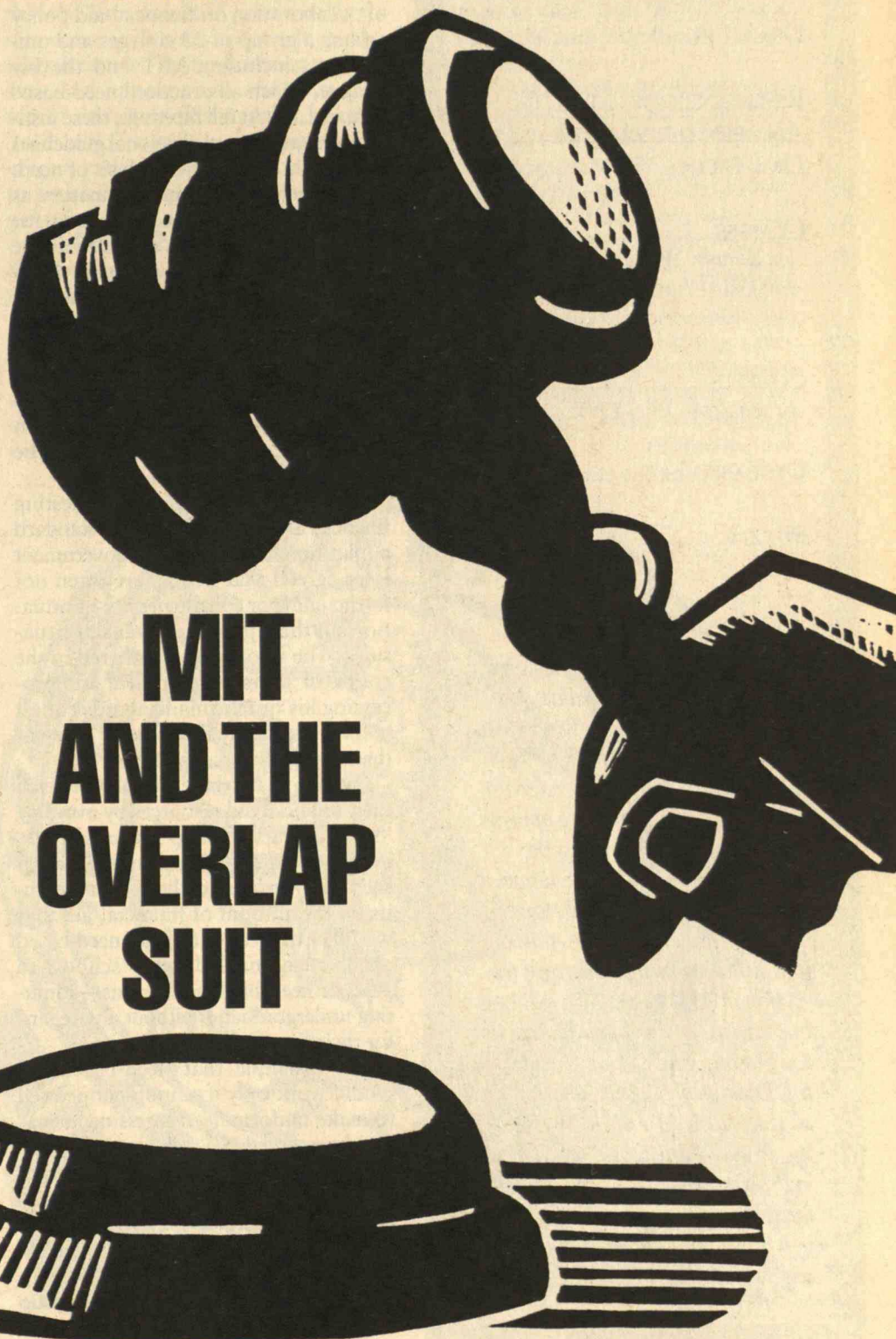
BY SUSAN LEWIS

**O**n the night before the Department of Justice antitrust suit against MIT was to open in the U.S. District Court in Philadelphia, the scene in the Institute suite in the Omni Hotel was intense. Lawyers were marshalling documents and preparing witnesses when the phone rang, and it was MIT President Charles Vest wanting to speak to Thane Scott, the lawyer heading the defense.

"I know you're busy, but I want to tell you a quick story," Vest began. "As a freshman about to enter college, I was awarded a small merit scholarship, but I turned it down, because I knew there were students who needed help more than I did. My attitude stemmed in part from an experience my father had as a mathematics professor at West Virginia University. One night, after a late meeting, he saw the light on in his office, and went up to find a student hard at work. The young man explained that the only way he could afford to stay in school was to find an unlocked office every night in which to study and sleep.

"MIT is in this fight for students like that," Vest said.

If the Department of Justice had understood MIT's determination not to compromise the interests of less privileged students, as embodied in that anecdote, years of work and a tremendous expenditure of Institute and government resources might have been saved. But as Scott explains, nothing in the history of enforcing the Sherman Antitrust Act on commercial enterprises, which exist to produce





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**Cover** *The editors and designers who work on the alumni/ae section of Technology Review have been trying to think of ways to make the section more relevant, more accessible, and more appealing to the eye. Identifying the section with a descriptive name, MITnews, launching our stories right on the cover, and—starting in a summer issue—printing the section on better quality yet less expensive paper will all move us toward our goals. And considering Dick Jacobs' letter, about how all units at MIT should be working to add value while keeping budget increases in check, we felt we were right on target. We hope you agree, and we welcome your reactions to our new look.*

## MIT and the Overlap Suit

continued

a profit, had prepared government lawyers for an opponent motivated by principle.

At issue in the lawsuit was the practice of "overlap"—more than three decades of collaboration on financial-aid policy among a group of 23 colleges and universities, including MIT and the Ivy League, which all practiced need-based financial aid. At fall meetings, these institutions agreed on professional guidelines that would govern the analysis of need. (The guidelines could include matters as simple as a uniform exchange rate for Canadian dollars or as complex as the procedures to be followed when a student's parents were separated or divorced.) Then at spring meetings, financial-aid officers shared family financial information they had assembled on students newly admitted to two or more member schools and agreed on the family contribution that would be expected for each student.

Although all students requesting financial aid are required to file standard application forms, even the government later agreed that people are often not forthcoming or consistent with information on their personal financial situations. The information gathered in the course of admitting a student and processing his or her financial-aid request at one college may therefore be different than that gathered at another.

Overlap enabled the schools to stretch their financial aid resources by avoiding "bidding wars" for top students or giving more aid to any student than he or she really needed. And because it set limits on the amount of financial-aid that would be offered to students, need-based aid in turn enabled many schools to practice need-blind admissions—admitting undergraduates without any regard for their financial circumstances.

The principle that need-based aid would work only if schools cooperated to make uniform need assessments was widely accepted in academic circles, and such cooperation was in fact recommended in a manual for student-financial-aid administrators approved by the Department of Education. Although for the purposes of this article the "overlap group" will be taken to mean the group

of 23 schools that included MIT, there were by 1970 more than 100 schools in 25 different groups nationwide engaged in overlap consultation with regard to their commonly admitted students.

By now, most MIT alumni/ae have heard that in December 1993, after a trial, an appeal, and long negotiations, the Department of Justice dropped its suit against MIT. The department put in



**ONLY SEVEN MONTHS INTO HIS PRESIDENCY, CHARLES VEST HAD TO DECIDE IF MIT ALONE WOULD RISK ITS RESOURCES AND REPUTATION TO FIGHT THE DEPARTMENT OF JUSTICE IN COURT.**



place an agreement that enables MIT and other institutions to resume collaboration to provide need-based financial aid to their students, as long as they meet a number of conditions.

Because joint efforts on behalf of need-based aid and need-blind admissions are validated in the agreement, MIT calls this a victory. Because the settlement restricts the circumstances under which the institutions may exchange information, the Department of Justice also characterizes the settlement as a victory. And although having both opponents claiming to come out on top has made for some confusing reports in the media, that's what makes an agreement possible: both parties can interpret it as a winning situation.

The fact remains, however, that for two years MIT alone fought for an unprecedented legal position: that the social benefit gained from overlap should be taken into account in determining if the practice violates the Sherman Act. And in the end, the court agreed with MIT.

### The Unfolding of the Paper Chase

In the late spring of 1989, the Justice Department began serving Civil Investigative Demands (CIDs) on selected colleges and universities, ordering them to provide documentation on the setting of tuition, financial aid, and faculty salaries. By September 1989, approximately 59 schools—including MIT—had received CIDs, and the first public notice that the Department of Justice was concerned about the activities of post-secondary institutions appeared in an article in the *Wall Street Journal*. Thane Scott, an antitrust specialist at the Boston law firm of Palmer and Dodge, was working with Williams College on its response to a CID when he was asked to add MIT to his caseload.

When Justice is concerned about potentially collusive practices among a number of companies, Scott says, it knows what documents to ask for. Corporate attorneys—well aware that a CID is “never good news,”—know how to respond. But the federal lawyers had no idea how colleges operate, and in navigating the unfamiliar

waters, Justice made broad, sweeping demands for materials. Soon campus officials and lawyers were screening what Scott describes as “boatloads of documents,” page by page, and shipping them off to Washington.

Scott recounts that a major decision point for the schools came in spring 1990, when a regular overlap meeting was scheduled. In spite of receiving eleventh-hour letters notifying them that the Department of Justice had serious concerns about the practice, the schools decided that overlap was necessary and appropriate, and only one school withdrew. The meeting, the last “old style” overlap gathering, was unique in that it was chaperoned start to finish by antitrust lawyers, which gave Scott an opportunity to spend two full days observing at close quarters the practice that he would soon be defending full-time.

By that fall, it was becoming clear that Justice had narrowed the focus of what had been a three-pronged investigation down to financial aid—more specifically, overlap. The

government began to take depositions, requiring college officers to appear in a U.S. attorney's office and answer questions under oath before a court reporter. Throughout the early phase, administrators and lawyers at the involved colleges were consulting frequently. But by late 1990 and early 1991, it was clear that the Department of Justice believed that it had a case against the Ivy/MIT group and a few other overlap schools. At that point, says Scott, MIT's position emerged as distinct from that of its overlap partners.

Paul Gray, '54, was president when the CID arrived at MIT, but on October 15, 1990, Charles Vest took office as MIT's 15th president and Gray became chair of the Corporation. Vest quickly grasped, he says, “how deeply ingrained in MIT culture was the notion that students from lower and middle class families can aspire to better their circumstances through the study of engineering and science.” He recognized that a disproportionate fraction of its students—typically on the order of 60 percent—required financial aid





and that the Institute had been committed for more than two decades to admitting capable students regardless of financial circumstances and to meeting their full need. Any practice that facilitated these goals was central to the operation of this place, and Vest became almost overnight a champion of overlap.

In spring 1991, with a lawsuit looming, the Ivies began negotiating a consent decree that would bar them for 10 years from engaging in the information-sharing and joint policy-setting that the Antitrust Division found objectionable. MIT, convinced that overlap was an appropriate activity in pursuit of a non-negotiable institutional principle, refused to sign. Vest observes that the consent decree had one "really strange" exemption: schools *were* permitted to cooperate to limit scholarships to varsity athletes. That suggested to MIT officials that the Department of Justice was not acting on the basis of a deeply held principle, and the Institute continued to press the argument that overlap promoted sound public policy.

Thane Scott had a number of encounters, starting in spring 1991 and continuing until after the government lost on appeal, with people at all levels in the Department of Justice, in which MIT was urged to sign the consent decree. Each time, he expressed MIT's willingness to cooperate while making it clear that the Institute was not going to compromise the principle at stake.

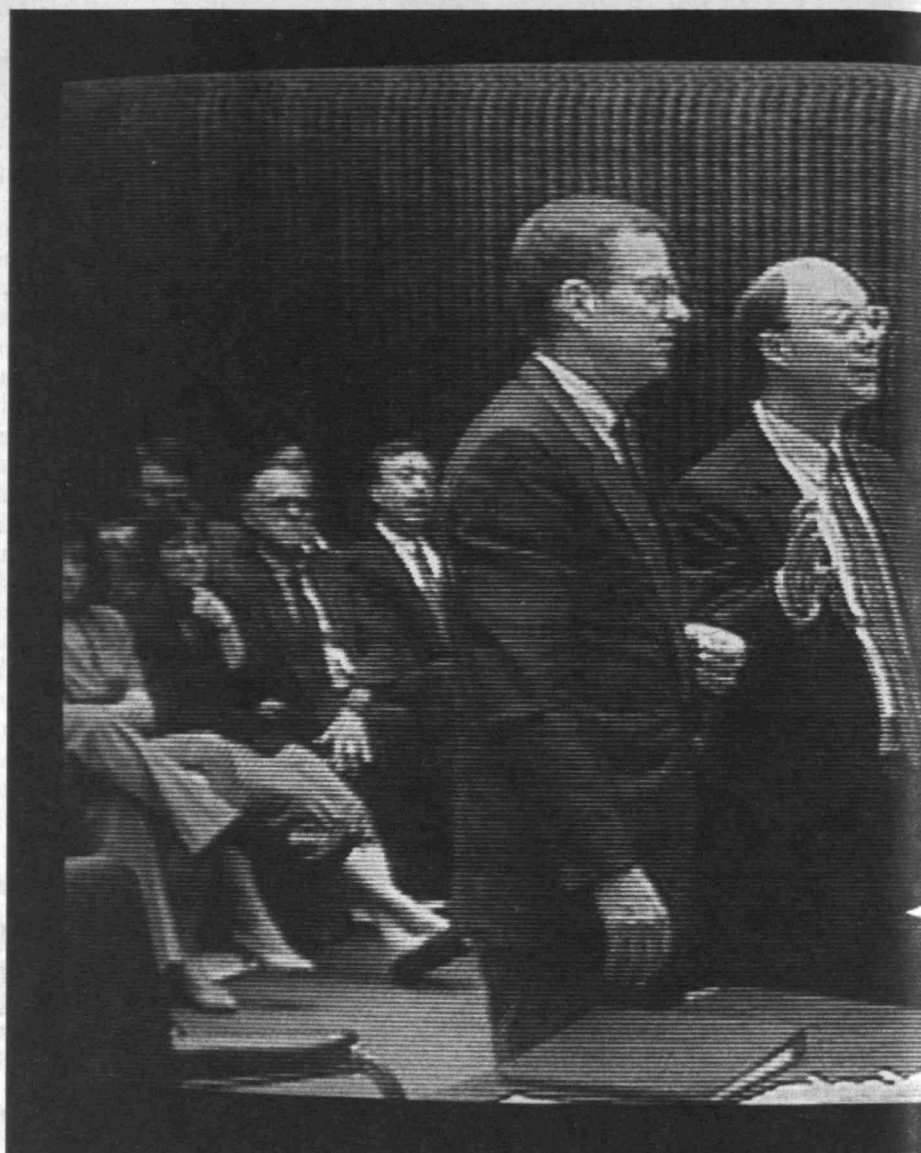
"No matter how many times we said this, and no matter how senior the person who heard it, they never believed it," Scott says. "And I don't fault them for that. They have 100 years of experience in dealing with commercial firms. I'm not familiar with any other case in which a consent decree that had no financial penalties and did not interfere significantly with the operations of a commercial institution was presented to that institution and not signed automatically. Firms only resist a consent decree where it would interfere with their profit-making potential."

Scott notes that when the Department of Justice published the official statement on the consent decree with the Ivies in the *Federal Register*, MIT was listed among the consenting defendants. He interprets the error as an indication of how convinced the department lawyers were that when push came to shove, MIT would sign. He believes that MIT's very persistence in fighting for principle

suggested to at least some of the federal lawyers that the overlap must have involved financial gain. What other possible reason could there be for a rational organization to refuse to cave in when it was looking down the barrel of a long, expensive lawsuit? Why else would elite institutions, ostensibly competitors, share information?

Paul Gray agrees that the people at the Department of Justice simply did not understand MIT. To them, he says, "MIT is an inordinately rich institution that can do anything it wants." The idea that MIT needed to cooperate with its peer institutions if they were to meet common goals and husband scarce resources just didn't compute.

While trying to win over the Justice Department, MIT was in the throes of its own decision-making process. MIT's Executive Committee (Corpora-



**IN AN IMAGE TAKEN FROM THE BROADCAST ON COURT TV, THANE SCOTT (STANDING AT RIGHT), THE LAWYER WHO LED MIT'S PRECEDENT-SETTING DEFENSE AGAINST CHARGES THAT ITS FINANCIAL-AID PRACTICES VIOLATED THE SHERMAN ANTITRUST ACT, IS FLANKED BY D. BRUCE PEARSON, THE LEAD GOVERNMENT LAWYER. MIT'S LEGAL BATTLE WAS DIRECTED ON A DAY-TO-DAY BASIS BY VICE-PRESIDENT CONSTANTINE SIMONIDES, WHO CAN BE SEEN SEATED JUST BEHIND PEARSON.**





weighed MIT's position. He was thinking about 20 years of backing down on important issues like

graduate student support and funding the true costs of government research—issues that will have an impact on the future supply of scientists and engineers and on the continued strength of the U.S. research effort. He was also thinking about 20 years of “federal intrusion in the workings of private universities,” dictating, for example, precisely how they must communicate with recipients of educational loans, what kind of data they must accumulate on their athletes, and how they report on campus crime to the families of students. To continue to back down when it came to a practice that was not only in the best interest of the Institute, but also of some of the most capable but least privileged members of U.S. society was, to Vest, intolerable.

Scott had been invited down to Washington for the antitrust version of “the last meal,” one final chance to sign the consent decree or try to persuade the Antitrust Division not to hit the switch. He found the government immovable and notified Simonides, who at that point had been overseeing MIT's legal response on a day-to-day basis for two years, that a suit was likely to be filed the next day. Simonides walked over to the president's house at 10:45 p.m. on May 21, 1991 (St. Constantine's Day—he remembers it vividly), and together they placed a conference call to Scott's hotel in Washington.

The trio discussed all the advantages, disadvantages, and practicalities of signing the consent decree, analyzed the ramifications of a major and possibly very protracted court battle, and weighed all that against the significance of the issue at hand. Finally, Scott asked Vest what MIT would do. Simonides remembers that the president paused, then simply said, “We will not sign, and we are fully prepared to go to court.”

The next morning, the suit was filed in the federal district court in Philadelphia (the farthest from Cambridge of all the jurisdictions in which the suit might have been filed). That afternoon, the Department of Justice held a news conference to announce that the Ivies had signed the



## MIT and the Overlap Suit

*continued*

consent decree, leaving MIT the only defendant to contest. (Many observers found it irresistible to speculate about possible political factors in the launch of the suit when, at another high-profile news conference two days later, then-Attorney General Richard Thornburgh announced that he was stepping down to run for the Senate in Pennsylvania.)

In what Scott describes as “lightning speed for a major antitrust case,” the 10-day trial opened in June 1992 before Chief Judge Louis Bechtle. Paul Gray, as the senior officer with a 20-year perspective on overlap (serving as chancellor and then president) and with a somewhat less crowded schedule than the new president, was the designated spokesperson for MIT on policy. Gray spent two full days giving a deposition and a half day testifying at the trial. Director of Student Financial Aid Stanley Hudson, Director of Admissions Michael Behnke, and a number of other officers of the Institute testified. Alumna Lissa Martinez, '76, spoke on the motivation of alumni/ae donors, who, as a group, are concerned that their charitable donations go to help students who are genuinely needy.

The economics of overlap became a critical factor in the litigation: there were questions of how the antitrust laws, which are based on economic principles, should be applied to nonprofit, charitable organizations. To provide answers, MIT was able to enlist Dennis Carlton, PhD '75, a professor of economics at the University of Chicago who often consulted for the Department of Justice, to do an economic analysis of the impact of overlap and what effect the demise of overlap could be expected to have in the future. Although he holds a doctorate in economics from MIT, Carlton went into the case a skeptic. He was not at all convinced that what the government was describing as collusion among elite schools like the Ivies and MIT was in the best interests of students.

After amassing and analyzing a specialized database, Carlton concluded that overlap was “revenue neutral,” that money saved on one student was spent on another. His data showed that although some individual students indeed paid more than they might have

tion chair, president, Vice-President for Resource Development Glen Strehle, '61, Vice-President Constantine Simonides, '57, and seven senior Corporation members) had held many sessions on the overlap question, and the committee supported Vest in fighting for the principle. Gray notes that of all the members of the overlap group, MIT is the only one that does not have in-house counsel. He believes that the fact that MIT administrators were not getting a lot of advice from a legal staff is another reason that MIT did not cave in right away. “The traditional advice of a lawyer,” according to Gray, “is that ‘this is going to be a lot of work; it's going to be a distraction; it's going to cost a lot of money. Let's just settle.’”

Vest says that the recent history of decades of university/government relations was also on his mind when he



# MIT and the Overlap Suit

*continued*



without overlap, there was no evidence that undergraduate students, as a group, had been penalized in any way.

The Department of Justice maintained throughout that universities are engaged in "commerce" to deliver educational services, and that the family contribution is effectively the "price" of education. Since the overlap schools cooperated to manipulate the price that would be charged to some of their customers—a *per se* violation of the Sherman Act—the effects of the practice were irrelevant. Scott says that he talked to a government lawyer who said that even if MIT were able to show that in fact all students paid *less* as result of overlap, the department would still have been opposed to it.

MIT argued that the price of education is not family contribution but rather tuition—which is the same for all applicants. In its brief, MIT showed that even full tuition covers only half the cost of education, meaning that recipients of financial aid do not receive a "discount," as claimed by Justice, but rather a larger subsidy from donors and endowment. By that rationale, MIT argued, financial aid is not a commercial transaction but a charitable activity.

In his September 2, 1992, decision, which was notable for what many critics termed his "intemperate" language and the intensity of his rejection of MIT's position, Judge Bechtle referred to MIT's claim that overlap served important social ends as "pure sophistry" and said it was irrelevant. Significantly, he essentially agreed with Carlton's conclusion that overlap was revenue neutral and rejected the government economic arguments that the practice raised prices and enabled MIT to reduce its expenditure for aid. But overall, Bechtle found for the government and ordered MIT not to exchange information or collaborate on policy with any other institution.

Gray notes that the trial judge did give MIT every opportunity to present all its arguments. Having its best case on record was of critical importance for MIT, because no new evidence can be presented in an appeal. And within hours of receiving Bechtle's decision by fax, President Vest held a news confer-

ence at which he announced that MIT would appeal. The Department of Justice again offered MIT a consent decree, which it declined.

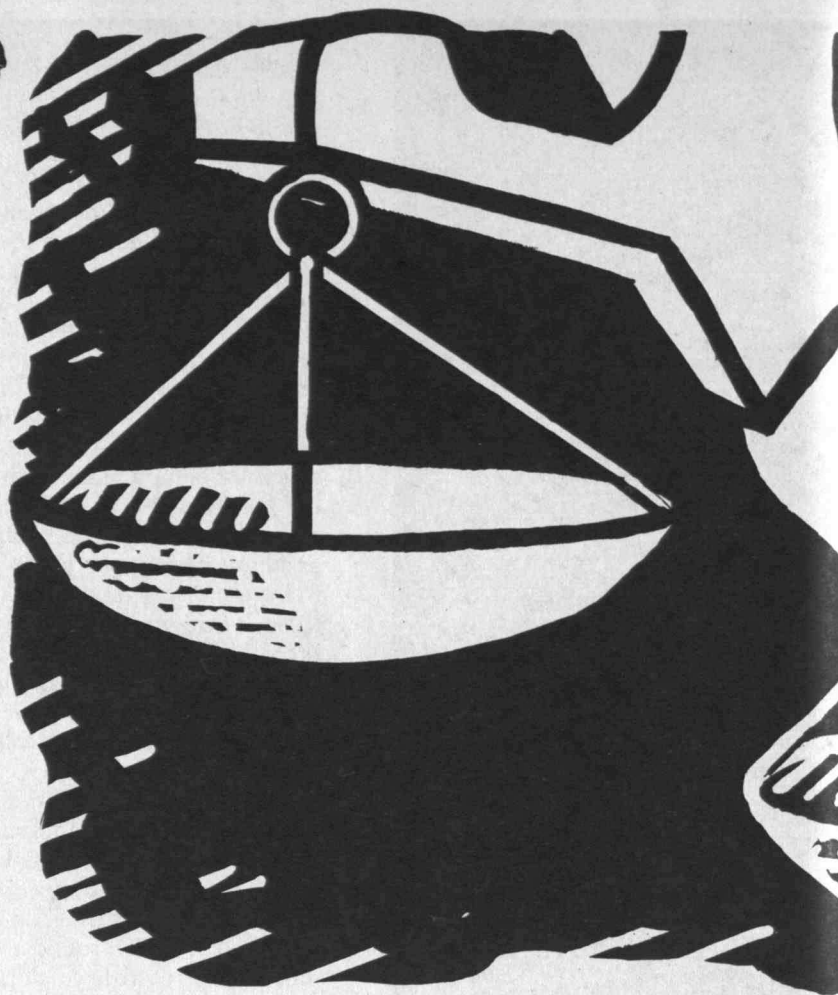
The appeal was heard in the Third District Court in Philadelphia in June 1993, and there were a number of indicators that this case was being taken very seriously: It was not argued before a routine panel of judges assigned to hear whatever was on the docket for that day, Scott reports, but before a panel assembled particularly for this case. Further, the judges granted a request that each side be allowed an almost unheard-of 30 minutes of oral argument, and then actually allowed closer to 45 or 50 minutes per side. The judges were well prepared, they asked many questions, and the exchange, Scott remembers, was intense.

The appeal decision, announced September 17, 1993, was in MIT's favor: Two of the three judges called for the case to be returned to the trial court of Judge Bechtle, with instructions that in reaching a new decision, he had

to consider the evidence of social welfare presented by MIT. In his minority opinion, however, Judge Joseph Weis, Jr., went further, saying that the case was seriously flawed and that in his view the suit should have been thrown out.

At this point, Justice was many months into the transition to the leadership of Attorney General Janet Reno. Although MIT was surprised to be offered, yet again, a consent decree not significantly different from those it had consistently rejected, the Department of Justice did begin a process of quiet negotiation to reach a settlement. In October, Robert Litan, the deputy assistant attorney general for antitrust, assumed leadership of the overlap suit. He met with Scott and economist Dennis Carlton and carefully considered the legal, economic, and social issues. Both Simonides and Scott credit Litan for bringing the case to closure.

Throughout the case, it was the focus of considerable media attention. Although the *Wall Street Journal* was







principal donors who enable MIT to be charitable and provide need-based aid," the alumni/ae were "in a unique position . . . to discuss the role of admissions and financial aid in obtaining a student body that is characterized by its merit rather than by the financial resources of the students' parents."

Ultimately, what made the Association brief extraordinary, Thane Scott says, is that it was an expression of support from the purported "victims" of "price fixing"—the graduates of the Institute—whose student-aid packages had been determined in a context of overlap for some 30 years. These were the former MIT students who, according to the Department of Justice, had been denied the opportunity to win merit scholarships. That fact was not lost on the appeal judges, Scott says.

The presenter of MIT's amici briefs was also extraordinary: A. Leon Higginbotham, Jr., a distinguished jurist, author on race issues, and veteran of 29 years on the bench. Introduced to the issues of the case by MIT's "local counsel," Andre Dennis, Higginbotham offered to serve as the attorney for the amicus brief of the

Philadelphia Public School System. Higginbotham went on to argue on behalf of many of the amici before the appellate court, where only months before he had stepped down as head judge.

Another powerful show of support, although it did not show up in the court record, came from the MIT faculty. At a faculty meeting where Simonides gave an update on the appeal, Professor Paul Penfield, ScD '60, expressed his great pride in being part of MIT and its stance on financial aid. His colleagues—every one of whom has a number of good ideas about what MIT might have done with the money it was spending on legal fees—all applauded.

### What Happens Now?

Observers are questioning what the practical impact of MIT's agreement with the Department of Justice will be on the financial-aid scene. The agreement establishes "standards of conduct" that will govern the activities of all non-profit educational institutions. These standards acknowledge the principles for which MIT fought: Schools are free to agree to provide only need-based aid and to prohibit merit scholarships. They may jointly develop uniform applications for collecting data from aid applicants and agree on principles of needs analysis, so long as these agreements do not eliminate professional discretion on the part of financial-aid officers.

The standards stipulate that before financial-aid offers are made, schools may exchange, through a central computer facility, data on commonly admitted applicants regarding family and student assets and income, how those assets and income will be evaluated, number of family members, and number of siblings in college. Each school may retrieve those data once for each aid applicant.

After student-aid letters are mailed out, the agreement allows schools to submit financial data to an independent third party (the College Scholarship Service in Princeton, for example, or a public accounting firm) for analysis. The third party will tabulate the data and prepare an after-the-fact report that circulates to all participating schools. For each pair of schools, the report will disclose the total number of cross-admitted students who receive aid as well as the number of such cross-admitted students for whom a substantially larger family contribution was calculated

unsympathetic to the schools' avowed charitable intentions, much of the other editorial comment on MIT's legal battle was supportive. The *New York Times*, the *Boston Globe*, the *Washington Post*, the *Philadelphia Inquirer*, and other publications around the country weighed in on the side of MIT.

Also noteworthy were the number of organizations such as the NAACP, the Congressional Black Caucus, the National Education Association, and the Philadelphia Public Schools, that made public statements in MIT's favor and in several cases prepared amicus curiae—friend of the court—briefs.

One important amicus brief, prepared by Donald Joseph, '63, expressed the sentiments of the Association of Alumni and Alumnae of MIT. Joseph, a Philadelphia attorney, had offered his services to the Association Board of Directors, which voted overwhelming support for the Institute position.

In the brief, Joseph noted that as both "beneficiaries of the high quality of the educational program at MIT" and "the

**NOTHING IN  
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ENFORCING THE  
SHERMAN ACT  
AGAINST  
PROFIT-MAKING  
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FOR AN  
OPPONENT  
CONCERNED  
ONLY WITH  
PRINCIPLE.**



# MIT and the Overlap Suit

*continued*



by one school or the other. The third party will also report how many students, if any, at each participating school received more or less support than they needed to attend that institution.

The agreement bars schools from discussing or agreeing on family contributions to be expected from individual aid applicants or on the mix of grants, low-interest loans, and student-employment income that will make up an individual aid package.

In sum, the agreement does not fully restore the old overlap, and without the option of comparing notes on individual students whose financial pictures are particularly complex, some variation in awards is bound to occur. But it does offer to financial-aid officers a mechanism for information exchange. It offers a means of detecting, in a general way, if any college is consistently deviating from the agreed-upon guidelines and awarding merit scholarships—a practice that would exclude a school from further participation.

All in all, not too bad. But, after months of negotiations, and only days before the agreement was to be signed, the Department of Justice threw in a last set of conditions that renders the others, for the moment, almost moot: In order to qualify as a “participating school,” an institution must practice need-blind admissions—that is, admit all U.S. citizens to its undergraduate programs without regard to family financial circumstance (admissions from the wait list are excepted). Further, an institution must meet the full need of each student for financial aid.

Since that is what MIT had been doing all along, it agreed to the new conditions. But nationwide, few of the schools that might wish to participate in forms of overlap can afford to keep need-blind admissions, keep need-based aid, *and* meet the full need of all their students. How to proceed when financial-aid money runs out is a moral decision, Paul Gray points out: A school can continue to admit students without regard to income, but tell the last students admitted that they will have to find their own way to pay for their education. Or it can select the last members

of the class from only those applicants whose parents can afford to pay.

Brown University, while still opposed to merit scholarships, was forced to switch to the latter form of partial need-blind admissions several years ago, and Gray is of the opinion that a number of other Ivy League schools have already followed suit or soon will do so. With at least one of its members officially barred by the new Department of Justice rules from playing the game, the Ivy League announced that none of its members would request that the consent decree be lifted (a legal formality) so that it could collaborate with MIT.

In essence, the courts made the Department of Justice give the football back to MIT, but the department then installed a wall that, for the moment, keeps other players off the field.

But all is far from lost. In 1992, alerted to the fact that the Department of Justice was creating a chilling environment for need-based aid, Congress passed an

amendment to the Higher Education Act that authorized schools to agree on “standards of professional judgment in needs analysis” as long as they did not discuss individual cases. At the time, however, the consent decree and the lawsuit with MIT hung over the aid scene and discouraged schools from taking advantage of their legal opportunity. Since MIT negotiated its agreement, Stanley Hudson says, informal conversations about standards of needs analysis have been increasing among some peer institutions.

The education-act amendment expires in September of this year, and an effort is underway, spearheaded by members of the Ivy League and supported by MIT, to bring in new legislation. The educational institutions seek provisions that will extend the previous options for schools committed to need-based aid, but relieve them of the requirements to practice full need-blind admissions in order to participate in information-sharing. Hudson believes such legislation would re-energize the collaboration.

John Crowley, the director of MIT’s Washington office, sounds guardedly optimistic when asked about the chances for legislative relief. He notes that the 1992 amendment would not have passed without the efforts of William Ford (D-Mich.), chair of the House Committee on Education and Labor, Massachusetts Senator Edward Kennedy, and other members of Congress. It’s up to the universities, Crowley says, to knock on all those doors and renew that Congressional support.

The positive public attention attracted by the MIT lawsuit should make such legislation more attractive to members of Congress. Crowley reports that in early February people were still coming up to congratulate him on MIT’s victory in the courts.

“The outcome of this case has had a strong impact on MIT’s standing in Washington—for the institution and for Chuck personally,” Crowley says. “[Vest] is acknowledged as having made a difficult and courageous decision that went against the conventional wisdom. It is an unambiguous net gain for MIT.”

If and when the desired legislation is passed, needy students nationwide will have cause to be grateful that the West Virginia University student who needed a place to sleep 40 years ago chose the office of Professor Lewis Vest. □

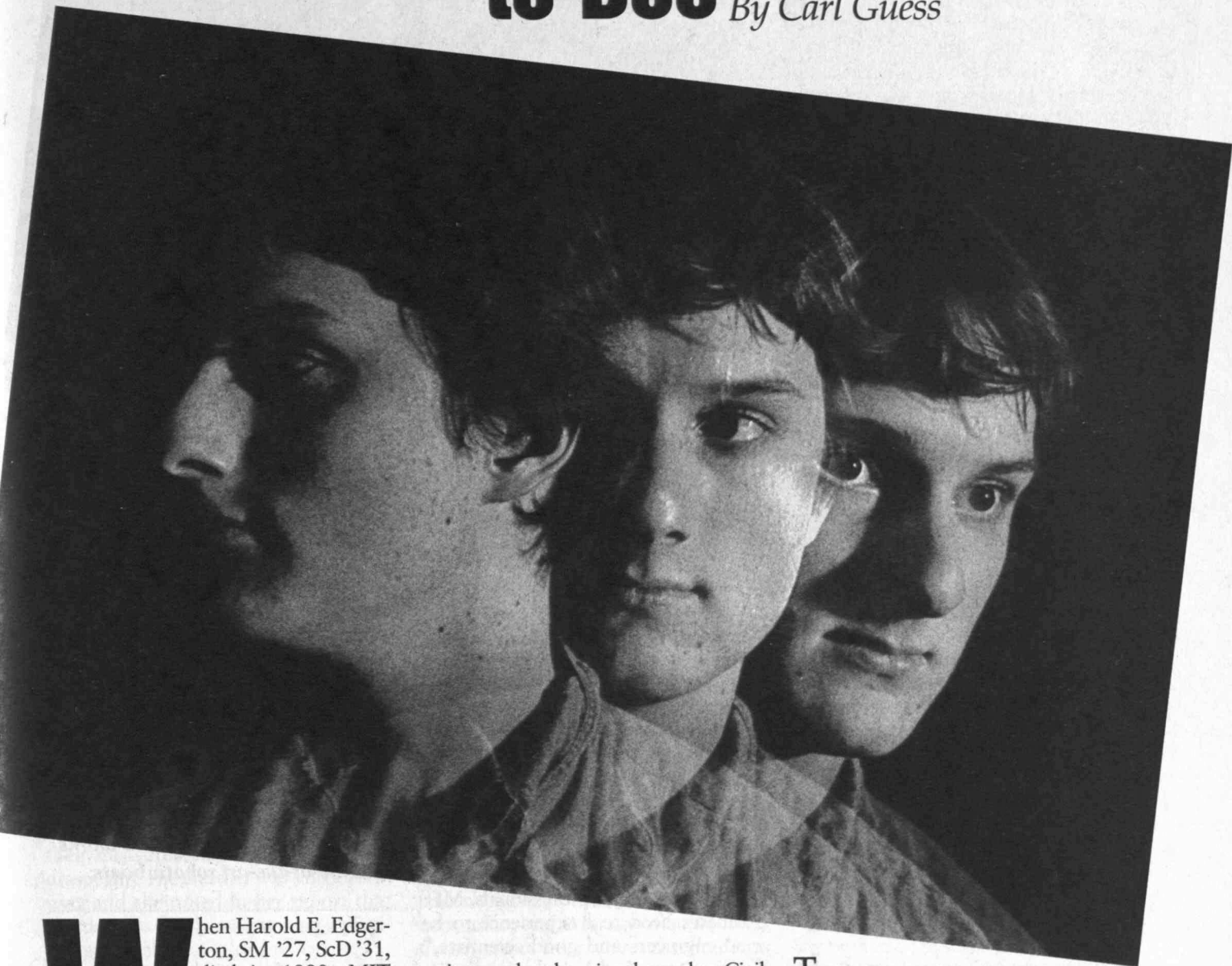
**“THE  
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OF MIT’S  
ARGUMENTS.”**

—*New York Times*



# A True Monument to Doc

By Carl Guess



**W**hen Harold E. Edgerton, SM '27, ScD '31, died in 1990, MIT faced the challenge of preserving a legendary legacy of technological innovation. As the father of modern strobe photography, "Doc" Edgerton captured everything from hummingbirds in flight to the interior workings of jet engines. He collaborated with Jacques Cousteau to develop techniques for underwater photography. And his sidescan sonar expertise was invaluable in

projects such as locating the sunken Civil War gunboat *Monitor*.

But Edgerton also had a hard-and-fast belief in experiential learning. It was not unusual for him to grab the first three students through his door in the morning, load them up with gear, and head out to find the answer to a question someone—probably Doc himself—had just posed. "What's wrong with right now?" was his standard scheduling strategy. It was that spirit of learning by doing that MIT and the Edgerton Foun-

*The portrait above, taken at the Strobe Lab in true Doc Edgerton fashion, captures graduate student Daniel Gruhl, a teaching assistant at the Edgerton Center.*

dation set out to harness when they established the Edgerton Center in 1992.

To fulfill its mandate to foster hands-on scientific learning experiences, particularly among undergraduates, the



# A True Monument to Doc

continued



Center offers a number of six-credit seminars every semester, on subjects ranging from strobe photography to tracking tuna. Every term they also offer the traditional Edgerton subject, 6.163, Strobe Project Lab, which carries twelve credits and fulfills the Institute lab requirement, plus a number of non-credit activities. Some 100 students were enrolled in the fall, about 70 of them were in their first year, which is just what Kim Vandiver, PhD '75, had in mind.

Vandiver is a professor of ocean engineering and the Center's director. As a graduate student, he served as Doc's teaching assistant for a year, an experience that convinced him of the pivotal role that the Center could play in helping new students adjust to the rigors of MIT. The "first-year syndrome" is well documented: having always been at the top of their classes, freshmen arrive at MIT to find themselves for the first time in the middle, or perhaps near the bottom of their class. Their self-confidence can take

a beating during this turbulent year, Vandiver says, so "it's important to provide opportunities where they can get some satisfaction and feel a sense of accomplishment."

Another oft-noted reality is that students are now arriving at MIT with considerably less in the way of mechanical skills than previous generations (who tended to fix cars, operate ham radio stations, and wire everything in sight). "As students and as professionals, MIT graduates need real experience to be good engineers and good scientists," Vandiver says. And even the most competent students can be "ground down by the problem-set style of the freshman year," he adds. "We want to keep their enthusiasm and creativity alive." For many undergraduates, their classroom learning can be substantially accelerated and reinforced when they have the opportunity deal with scientific and engineering concepts by working with machines and materials in laboratory, workshop, and field settings.

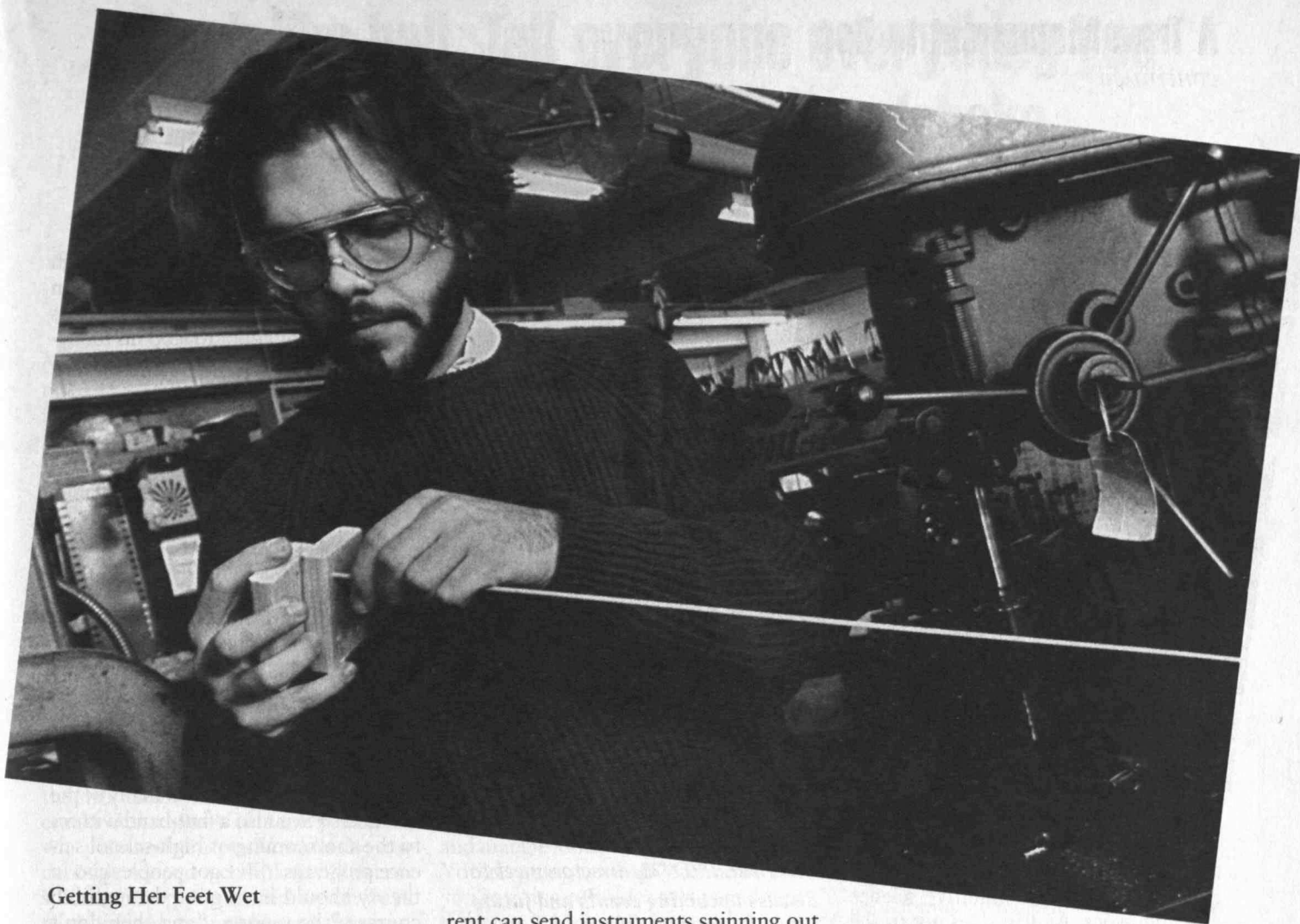
The Edgerton Center also provides

Professor Francisco Fernandez-Gonzalez (left), with Charles Mazel, SM '76, (center), and a student, gathered for the class, "Hands-On Technology of Historical Shipbuilding," offered at the Edgerton Center during IAP (Independent Activities Period).

Cashman Andrus, '94, (far right), working on a ship model, also works on state-of-the-art robotic boats.

access to equipment, shop space, and a notable student-to-instructor ratio of about 10:1. In this intimate setting, students are comfortable asking questions. More important, they have an opportunity to find mentors who can guide and counsel them over their years at MIT. They even have a good time. It all flows from Edgerton's spirit, explains Vandiver. "Doc had a saying: 'The trick to education is not to let students know they're learning something until it's too late.'"





### Getting Her Feet Wet

**P**hoebe Lam, '97, and her colleagues were on the dock of the MIT sailing pavilion late in the fall semester, lowering a pair of photoreceptors into the Charles River. They payed out the cable slowly, keeping it taut, knowing that if the light sensors drifted into the shadow of the dock, their measurements would be altered drastically. The weather was uncooperative, and she noted in her report that clouds were slowly overrunning a previously clear sky.

Lam is a first-year student enrolled in "Do-It-Yourself Ocean Measurements," taught by Charles Mazel, SM '76, a research engineer in ocean engineering and a heavily involved instructor in the Edgerton Center.

Perched on a stool in an Edgerton Center lab later, Lam talked about the challenges of working in a hands-on setting. The nature of field work is inherently different from solving classroom abstractions, she explains. Weather can change, cables can tangle, a river's cur-

rent can send instruments spinning out of position, and devices can break. "In the classroom," she points out, "you can assume that those things don't happen."

And then there are the data: under ideal conditions in salt water, the relationship between light and depth is linear. Yet when Lam and her colleagues took their light-sensor measurements, their results did not fit that profile. With their discovery, they ran headlong into the underlying lesson of the course: the importance and necessity of questioning the origins of research results. Students will confront such data throughout their academic and professional lives, and Mazel wants to make sure they interrogate it thoroughly. "What were the stages the scientists went through?" he demands rhetorically. "What were the errors they made?"

When the light readings produced by his students seemed too low, Mazel had them measure the particulate matter in the Charles. They discovered that the river's unusual turbidity was affecting light measurements. A relatively

straightforward explanation, but an important lesson. "If students have a healthy disrespect for data as a result of this seminar," says Mazel, "I'll be happy."

### A Senior Comes Back for More

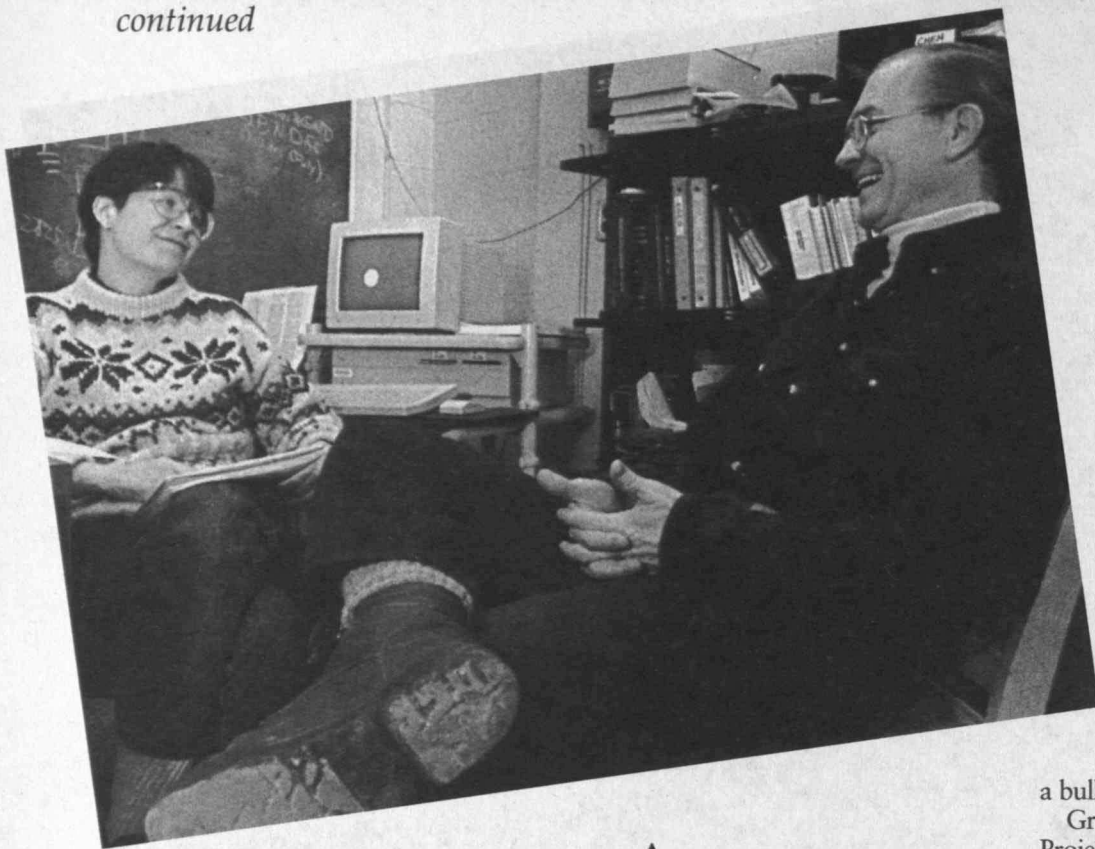
**O**n an afternoon last fall, Cashman Andrus, '94, wheeled his bicycle into a laboratory off the Edgerton Center's main hallway, known as Strobe Alley. He stashed his helmet and day pack under a lab bench, a large silver earring bobbing up and down as he moved. Walking over to a workbench, Andrus flipped on a computer and the word TUNA appeared on the screen in luminescent green.

Andrus was participating in the Edgerton Center's "Tracking Tuna" seminar, led by two research engineers in the Sea Grant Program, Clifford Goudey, SM '77, and Thomas Consi. The goal of the seminar group is to create a small robotic craft that can track



# A True Monument to Doc

continued



the movements of a school of tuna and report back to land-based scientists automatically.

A senior studying cognitive science and linguistics, Andrus does not fit the stereotype of a freshman making his first foray into a hands-on environment. He already has one robotics course under his belt, as well as computer science and electrical engineering classes. Success in this seminar demands that he apply knowledge gained from all three academic areas.

Using conventional methods, tracking tuna requires long hours and deep pockets. Scientists must hire a boat and crew and locate a school of fish. After attaching a sounding device to one of the fish, they must follow it for a week or more, charting its positions and tracking its course. Goudey, Consi, and their seminar students hope to drastically shorten this process by building an autonomous boat that scientists can launch after the initial fish tagging. The boat would follow the fish for days or weeks at a time, using signals from a global positioning satellite (GPS) to calculate and relay its position to scientists on shore who are tracking the school's movement.

*Andrea McGimsey, '87, program coordinator, and Kim Vandiver, PhD '75, director, meet to discuss upcoming events and future plans for the Edgerton Center.*

Andrus programmed the electronics that guide the four-foot boat. Four sensors—altogether about the size of a fist—monitor the “pings” from the sounding device attached to a tuna. An analog-to-digital converter translates the signals into data that on-board microprocessors incorporate into instructions for the boat's propeller and servo-controlled rudder—as the fish turns or changes speed, so does the tracking boat. The GPS receiver attached to the craft lets scientists monitor its position to within three meters on the open ocean.

Andrus says one of the benefits of the Center's seminars is that they are “a great way to wear off the aura of professorism.” As a freshman, Andrus says, he was too cautious. “It took me two years to get over the fact that instructors were just people.” Although he reports having a hard time “convincing new students to come in and mess

around instead of slogging through their problem sets,” the twinkle in Cashman Andrus's eye suggests he is not about to stop his lobbying any time soon.

## The Learning Is Fun; So Is the Teaching

**G**raduate student Daniel Gruhl can often be found gliding from one darkroom tray to the next, adding splashes of stop-bath and fixer with a chemist's confidence. Slowly, familiar images begin to emerge—a business card, say, with

a bullet passing through it.

Gruhl is a teaching assistant in Strobe Project Lab and works with many of the freshmen. He is also a first-hand witness to the shortcoming of high-school science programs. “I've got people who in theory should have gone through lab courses,” he reports, “and they don't know how to use a voltmeter to check batteries.”

Incoming students work well with abstractions, Gruhl says. “You can give them a problem with nine pages of algebra, and they chug right through without a mistake.” But when confronted with a problem that does not have a single answer, in an environment in which there are no set rules, they often founder. “These aren't dumb kids,” he explains. “It's just that none of them have approached a problem like this before.”

To develop practical ways of thinking, Strobe Lab students perform a series of lab experiments, each of which is designed to fail in some way. Many panic at the first sign of trouble and immediately appeal for help, but the staff is not too quick to bail them out. Gruhl insists that the point of these exercises is not getting a correct answer, but helping students to believe in their own problem-solving abilities. Instilling this belief means starting with basic, defined tasks and slowly working into more



# "Work like hell. Tell everyone everything you know. Close a deal with a handshake. And have fun."

—Doc Edgerton

open-ended projects. One success builds upon another until the students are comfortable experimenting in a world with few boundaries. "As soon as they believe they can do it," Gruhl marvels, "they barrel right through."

In the fall semester, Gruhl had a group of students who wanted to measure crack propagation when various kinds of glass were hit with a hammer. They calculated that they had only about 10 nanoseconds to shoot the picture, and they puzzled over their approach as Gruhl dropped a few hints here and there. The strategy Gruhl had in mind was taping to the glass a piezoelectric microphone that would pick up the vibrations of the swiftly moving cracks and trigger a camera. But Gruhl was pleasantly surprised when the students developed a completely different solution: the group is working on ways to shoot laser beams through the glass, using the interruption of the light as a camera trigger.

Now a master's candidate, Gruhl is considering a doctoral degree and a career in teaching. "I had no idea how much I would enjoy teaching when I started here," he says, "but now I'm seriously thinking about it."

## It May Be Fun, But It's Not Cheap

If a student discovers what truly interests and excites him or her through one of its seminars, Kim Vandiver believes that the Edgerton Center has been successful. These students, he says, are MIT's ambassadors. For example, when Phoebe Lam's high school newspaper in Montreal asked her to write about her experiences at the Institute, the Center was high on her list. It enabled her, she wrote, to "be in touch with people performing actual research and work side by side with them."

Such endorsements are invaluable as Vandiver expands the Center's seminars

and facilities. In the future, he hopes to create a resource clearinghouse for students requiring particular tools and equipment, but it won't be easy. While the campus has a number of machine shops, many don't offer the modern fabrication technologies MIT students should be learning. For instance, an electrical engineering student can design a circuit on a computer, but it may be difficult to secure the equipment for manufacturing a printed circuit board. "Getting a board made up should not be an obstacle to the next great piece of avionics or an autonomous underwater vehicle," Vandiver insists.

Dan Gruhl concurs, adding that hands-on learning is expensive by its very nature: "You're going to break stuff and mangle tools; that's part of learning. You're going to ruin components—you're going to solder things and burn them out." And unless an institution can absorb the costs associated with replacement, he says, experiential learning "is just not practical."

The Center owes its very existence to the trustees of the Harold and Esther Edgerton Foundation, who agreed to provide operating funding for the Center for the next three years and have made provision for a permanent endowment, which has a present value of \$6 million.

But Vandiver sees a need for additional donations of funds and equipment if the Center is to serve the number of students who could benefit from its programs and also to expand its outreach through projects like "corridor laboratories." When Doc roamed the campus, students and visitors never knew when they might literally bump into an opportunity to learn something. That was the experience Professor John G. King of physics had in mind when he set up what he intends to be the first of many corridor

laboratories in the Hayden Library. Modeled on the viewer-operated displays that Doc designed for Strobe Alley, his technological salon on the fourth floor of Building 4, corridor laboratories provide readily accessible demonstrations of scientific concepts.

While more resources would unquestionably facilitate more activities, the critical element of Doc's spirit appears already firmly entrenched. Kim Vandiver smiles: "We're having a lot of fun so far." □



## DOC EDGERTON'S

personality attracted people from many walks of life to work on diverse projects of mutual interest. If you were one of them, the "Friends of Doc Club" would like to hear your stories about Doc and help you maintain contact with others who have shared "the Edgerton experience." Anyone interested in joining the club should contact Peter Mui, '83, P.O. Box 2112, Berkley, CA, 94702-0112, or [peter@ora.com](mailto:peter@ora.com).



## FRIENDS OF DOC, other

members of the MIT Club of Rochester, N.Y., and the staff of the Edgerton Center at MIT are participating in the development of "Strobe Alley: the Creative Legacy of Harold Edgerton," an interactive exhibit scheduled for Nov. 18, 1994 through March 12, 1995 at the George Eastman House International Museum of Photography. Bill Hoseley, '48 (716/385-3719) is the liaison between the museum and the Club of Rochester for the exhibit, which is expected to travel to other U.S. cities and abroad.



A Letter from Richard A. Jacobs, '56

# Re-engineering at MIT

Over the next four years, the Institute needs to reduce its budget by about \$25 million—which represents about eight percent of the “controllable” budget, after excluding sponsored research. The “why” is simple enough. It’s either cut at that scale or continue to dip into endowments, raise tuition, or tamper with the quality and scope of education at the world’s leading engineering and science university. None of the latter are acceptable as long-term solutions.

The budgetary goal was established by President Charles Vest, and he, Provost Mark Wrighton, and Senior Vice-President William Dickson, '56, have the task of making it happen. The simple way to meet the target would be to issue an administrative order to all unit heads to cut their annual budgets by 2 percent per year for the next four years. This approach would work, but after a time erosion would begin again and a new bail-out order would be required. Further, it’s a strategy that would penalize most heavily the so-called “lean and mean” departments, which had already cut the fat out of their operations. Since personnel costs are the dominant portion of most budgets, across-the-board cuts would force the better-run departments to redeploy some of the very individuals who had worked hard to make their units cost-effective.

Enter re-engineering: a much-publicized management technique for improving business performance that is being introduced by the MIT administration. The features and approach involved in this technique are laid out in the best-seller, *Re-Engineering the Corporation*, by James Champy, '63, SM '65, former executive vice-president of the Alumni/ae Association, and Michael Hammer, '68, PhD '73, a former professor at the Sloan School.

The essence of re-engineering is to view the business horizontally as a means to improve processes—the multi-functional steps by which work is con-



verted into results in any organization. This contrasts with classic analysis, which looks vertically through the functional silos around which most businesses are structured. (In a university context, functional silos would include academic departments, Information Systems, Resource Development, Housing and Food Services, and so forth.) Then, rather than make small “fixes” in various corners of the organization, re-engineering seeks creative, alternative solutions for accomplishing the process. The target is a quantum leap in performance results.

The theory behind re-engineering is that much of the excessive cost, quality slippage, and lost time of operations are generated in unit-to-unit hand-offs. An improvement in one function might produce no change in business results, since a chain is still no stronger than its weakest link. By improving the whole process, on the other hand, results are enhanced. Think of a business unit, for example, that decides to put one of its hand-processed reports on a computer. This saves a lot of time. But if no one else in the organization uses the report, the functional improvement doesn’t generate any true business value.

One can hardly pick up a management magazine today without reading of

the great gains realized through re-engineering. A few of us more skeptical alums wonder if it is truly a management panacea, or is it in reality today’s hula hoop—the organizational fad of the moment? Frankly, the skeptics have a lot of evidence on their side. Even the champions of re-engineering acknowledge that 70 percent or more of all programs to date have failed. Even more pertinent to MIT, re-engineering has never been successfully undertaken in a major university environment. While some management consultants poo-hoo the argument that “my organization is different,” I believe that many of the operational considerations in successfully running a not-for-profit research university are quite different, say, from those of McDonald’s or Motorola.

This is not to say that re-engineering is without merit—I am persuaded that it has many results-oriented strengths. But it is not the holy grail—the magic strategy that some organizational leaders hope will instantly improve performance with little effort, investment, or need for change. If a way could be found to capture the strengths of re-engineering and add them to MIT’s existing arsenal of improvement ammunition, it could be more than the latest buzzword.

A classic example of the buzzword phenomenon was Theory Z, which was all the rage a few years ago, when the field was dominated by the notion that any Japanese management technique is better. As I recall, Theory Z used worker participation to solve business problems, but its central ideas were quickly absorbed into new techniques.

In the 1980s, American businesses, shaken by the Japanese domination of the auto industry, embraced Total Quality Management (TQM), a reorienting of organizational culture such that every employee participates in efforts aimed at “perfect” products. In traditional organizations, the expense of “fixing” defects and failures in output can



approach 40 percent of operating costs. TQM is an attempt to short-circuit that scenario by doing things right the first time, using statistical, analytical, even qualitative interview techniques to isolate causes of quality failures or customer disappointments.

Under TQM, quality is defined broadly to include product reliability, service, consistency, and other contributors to customer satisfaction. TQM has the potential to lower costs, producing savings that can be used to improve profitability and free monies for investing in development of new or better products and services. The organization that excels at TQM has a competitive advantage—it is the customer's supplier of choice.

MIT has invested heavily in and is still developing TQM, and one might well ask why, then, do we need re-engineering? Alternatively, if we believe that the results of TQM on campus still leave room for improvement, what reason has MIT to think that re-engineering would be any more successful?

Certainly, TQM success stories are out there. Notably, the revitalization of the American automotive industry, led by Ford, can be traced to serious investments in TQM. And all the successful examples have a number of common features: Begin with a commitment from top management and involve all of the organization's executives. Make TQM the number-one priority for deploying resources. Set challenging goals. Finally, involve the organization "bottom-up" in identifying and solving problems and implementing improvements.

At MIT, most departments have embarked on some form of TQM. Information Systems, for example, has already been through one complete cycle of quality improvement teams, one of which developed a simplified process for managing an inventory of 1,000 workstations, printers, and servers in the Athena network, thereby facilitating faster, more cost-effective servicing. But

for most units, TQM is a non-event or at best an unqualified "maybe," with more enthusiasm than substantive results.

What's holding MIT back? To begin with, although I believe Chuck Vest, Mark Wrighton, and Bill Dickson are committed to TQM, they must deal with new and important crises that crop up continually. Unlike a corporation focused on making products and profits to the exclusion of all else, MIT's leaders cannot just put issues such as harassment, fund raising, minority access, and government relations on hold while they attend to TQM.

**T***apping the  
strengths  
of TQM and re-  
engineering may  
enable MIT to  
enhance quality  
and still curb  
budget and tuition  
increases.*



The traditional goals of TQM are also less than an ideal match for MIT. "Better quality, better customer service, and lower cost" are all good qualitative criteria by which to measure a TQM program—but they are substantially different from a hard, measurable target such as \$25 million in budget savings over four years. Further, few department and laboratory heads at MIT seem to have specific measures and goals by which to gauge their progress toward TQM. And even when applied most effectively, TQM is still more likely to produce functional rather than process improvements.

Despite these problems, I think it would be a mistake to abandon the investment in TQM to get on with re-engineering. Far more productive for MIT would be to weave the strengths of each methodology into something unique in university circles: a program designed to both add value and help bring spiraling budget and tuition increases under control. I am particularly encouraged by the re-engineering program developed by Chuck Vest's management team, a program that has all the right elements and is off to a good start. Among its key points:

- MIT uses the term "re-engineering" to mean taking a fresh look at the historic why, what, and how of university operations. Then it will use this knowledge to develop and implement appropriate changes to shrink process cycles and reduce costs.

- MIT plans to provide the resources needed to make the program successful, including adequate project management, expert and objective counsel, training, and the support of key members of the faculty and administration.

- MIT leaders recognize "costs can't be cut to prosperity." Cost-cutting must always rank below producing a quality product. Even in a time of overall trimming of expenditures, new investments will be required to enhance departmental strength and take advantage of inno-



# Re-engineering at MIT

continued

vative fund-raising opportunities. The MIT program is not a "two percent to balance the budget" straitjacket. It allows for reordering the priorities of some current activities so that resources might be redeployed to more productive use.

•It's axiomatic in the management-consulting profession that the enemies of improvement are aversion to change at all levels and staff suspicion of the motives of leadership. The best way to inspire trust while introducing change is to talk about what's going on. Vest and Wrighton made a positive step toward bringing the entire community on board by holding their first "town meeting" in Kresge Auditorium to discuss the budget and answer questions. Additionally, MIT will use a participative approach from "bottom to top" to consider what changes might be genuinely beneficial to the institution. The opportunity is there for everyone to ask "why" and add their input.

•What may ultimately distinguish this

program from others, including the failed efforts of industry, is a continuous planning and improvement process under which all functions and activities will be reviewed annually.

In the past, there was a tendency to regard all existing activities as carved in stone; then initiatives to meet new challenges would form an additional layer of demand. The old strategy paved the way for recurring budget crises. No matter how large the Institute endowment, no matter how generous its donors, there will never be enough money to do everything we have ever done before, plus move in important new directions. And the hard-nosed decisions about what is essential and what functions or activities can be dropped cannot be made by unit managers trying to run efficient departments, laboratories, and the like. Such decisions must be made at the highest levels of management by those with the broadest view of institutional goals.

MIT's sound intentions could get a

boost from the expertise of others—particularly alumni and alumnae, since few of those working in industry have not been through improvement programs. People like Ray Stata, '57, SM '58, founder and chair of Analog Devices; John Reid, '61, chair of Citibank; and William Weisz, '48, vice-chair of Motorola, all have extensive experience with TQM, and they form a reservoir from which the MIT leadership might draw. In the same spirit, I'd like to hear your thoughts and suggestions, and I think it would be valuable if Institute leaders did as well. This program of making an institution that already works well work even better is something to which we can all contribute.

Best wishes,

*Richard A. Jacobs*

Richard A. Jacobs, '56, President, Association of Alumni and Alumnae of MIT

## Alumni/ae Week Reunions 1994 Technology Day



"C'mon back to Tech, dam it!"

To receive a complete schedule and registration form, call Alumni/ae Activities Coordinator, Jane Snyder at 617-253-8232.

### Thursday, June 2

- Cardinal & Gray Reception
- Pre-POPs Dinner
- Tech Night at the POPs
- Post-POPs Gathering

### Saturday, June 4

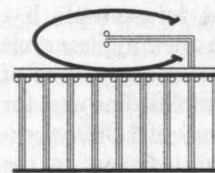
- Scheduled tours of MIT's architecture and permanent Fine Arts collections.

### Friday, June 3

- Memorial Service
- Technology Day Program  
*For the Wonder of It All: The Arts at MIT*
- Technology Day Luncheon
- Technology Day Reception
- Cardinal & Gray Dinner

### Sunday, June 5

- *Love Letters*, by Prof. J.R. Gurney, Dept. of Literature with Kitty Carlisle Hart.



MIT  
Cardinal and  
Gray Society



# ClassNotes

15

Please send news for this column to:  
Miss Joyce Brado, secretary  
491 Davison Road, #9  
Lockport, NY 14094

16

Please send news for this column to:  
Bob O'Brien, secretary  
25 Keith Road  
Pocasset, MA 02559

17

Please send news for this column to:  
Don Severance, secretary  
29 Hampshire Road  
Wellesley, MA 02181

18

Congratulations to **Herbert B. Larner**, who celebrated his 100th birthday November 28 at William Hill Manor, where he has a retirement cottage. His friend, Jack Wean, flew up

from Florida. Deputy Surgeon General Robert A. Whitney, Jr., came from Washington to present him with the Surgeon General's

public health duties. Someone in St. Louis, where the archives of the health service are kept, learned that I was still alive and brought these facts to the appropriate people in Washington, with the above results."

The family of **Eaton James Clogher** sadly reports his death at age 98 in Madison, Conn., last October 21, after a brief illness. He was predeceased by his wife, Marie Louise, and leaves three children, eight grandchildren, and three great-grandchildren. After receiving a degree in electrical engineering, Clogher worked for General Electric. He was an officer in the Army Air Service during World War I, where he took part in the development of communication technology between the airborne plane and the ground. He began work with D.V. Frione and Co., a road construction company in Foxon, Conn., in the late 1920s and worked with them until his retirement at the age of 77. While with Frione, he started a stone quarry business and a ready mix concrete business. "Eaton Clogher was a man who was respected by his peers and his family," says his daughter, Patricia Sherman. "His legacy is best expressed by his granddaughter Lisa who dedicated her PhD thesis in nuclear physics to him just this summer—to my grandfather, who told me time and time again, the important thing is to learn how to think, not what to think."

tional aids. He was stationed for a time in a small town in Italy, where the commanding officer was Army Major Fiorella LaGuardia, the future mayor of New York City. When Greely returned from the war, he became a chemical engineer at the Domino Sugar refineries in South Boston and Charlestown, and worked there for more than 40 years, until his retirement in 1962. He was an avid sailor and member of the Hingham Yacht Club, where he sailed his 18-foot sailboat, *Echo*. He was also an avid gardener and furniture maker. He leaves a son, a daughter, seven grandchildren and six great-grandchildren.

**Donald D. Way**, retired executive of Singer Manufacturing Co., died July 1, 1993, in Westfield, N.J., at age 96. During his 45-year career at Singer, he worked in New York City, Italy, and in Latin America. As chief engineer for the Diehl Co., a subsidiary of Singer, he was in charge of relocating the plant to Finnerde during World War II. Before his retirement in 1964, Way served as assistant VP of the Latin American Division and started new plants in Mexico and Brazil. Way was honorary secretary of the MIT Educational Council for 35 years. He served in the Army Signal Corps during World War I. He leaves his wife of 55 years, Barbara, three sons, and a daughter.

**George Michelson**, treasurer of the J. Slotnik Co. of Boston, died July 6, 1993, in Beth Israel Hospital at age 94. He founded the Construction Supply Co. in the 1920s and joined J. Slotnik in 1930, remaining active with the company until his death. He had a lifelong commitment to Jewish philanthropic and educational institutions locally and nationally. He was a past president of Hebrew College in Brookline from 1959 to 1962, later becoming life trustee. He was also a life trustee of Congregation Kehillath Israel, honorary trustee of Beth Israel Hospital, and past president of Jewish Family and Children's Service, Boston Service for New Americans, and New England Regional

**HAPPY 100TH!** To **Herbert Larner**, '18, of Easton, Maryland, who passed the century mark in November. Larner is shown at left receiving the Surgeon General's Medallion and below, with the tree planted in his honor for the occasion.



Medallion "for a lifetime of exemplary performance and outstanding accomplishment in the field of public health research and practice." To commemorate the event, Larner was invited to help plant a tree near his cottage.

How did this all come about? Larner explains: "More than 70 years ago before I became associated in business with the M. W. Kellogg Co., I was a member of the U.S. Public Health Service and carried on a variety of

**Benjamin M. Greely**, of Medfield, Mass., a World War I bomber pilot, died November 24 in Norwood Hospital at age 97. During the war, the Navy had no way of transporting its planes overseas, so Greely flew an Italian-made, three-engine, open-cockpit Caproni biplane for which he had to earn his Italian flight wings. He flew night bombing runs from France and Italy, extremely hazardous duty in the days before flight instruments and naviga-

Council of Jewish Federations and Welfare Fund. He was predeceased by his wife, Bella, and leaves two daughters, a son, a brother, ten grandchildren, and one great-grandson.

We salute the contributions of these outstanding alumni and express sympathy to their families.—ed.

Please send news for this column to: Class Notes Editor, *Technology Review*, 201 Vassar St., Cambridge, MA 02139



# 19 75th Reunion

Louise Pierce Horwood, a public health worker and longtime resident of Cambridge, Mass.,

died while visiting her son in Hamilton, Ontario, Canada, on August 5, 1993. She was 102 years old. She was the wife of the late Dr. Murray P. Horwood, professor of biology and public health at MIT. Mrs. Horwood was very active in student, faculty, and alumni affairs and helped establish a residence for women students.

In 1952-1954 they lived in Burma where Professor Murray directed MIT education at University of Rangoon. She is survived by her son and two daughters. A credit to MIT, we honor her memory.

**Charles W. Drew**, for whom the MIT Alumni/ae Association has only an address "in care of" in Minneapolis, died on August 11, 1993. If any readers of these notes can supply any further information, I will report it to you for this good classmate.

The MIT Alumni/ae Association also advised us of the death on August 25, 1993, of **Walter J. Creedon**. His address at the time was Lutheran Home 15 at 255 E. Main Street, Moorestown, N.J. He was a native of Brockton, Mass., and a long-time resident of Moorestown, N.J. Like so many young men of his time he served his country as a lieutenant in the Army Air Corps during World War I and he was a pilot for the Air Service Flying School, Fort Sill, Oklahoma.

He was president of Seaboard Construction Co. of Chelsea, Mass. Walter was predeceased by his wife, Ethel, and two children. Surviving are two brothers, eleven grandchildren and thirteen great-grandchildren. Truly a worthy member of our class of 1919.

We are again indebted to the MIT Alumni/ae Association who have advised us of the death on July 27, 1993, of **Douglas M. Burckett** in his home in Lincoln, Mass., where he has lived for the past 40 years.

Mr. Burckett was born in Brooklyn, N.Y., and attended high school in Somerville, N.J., before going to MIT for both undergraduate and graduate degrees in electrical engineering. His college years were interrupted by World War I service in France as a member of the Army Corps of Engineers.

After graduating he went west and worked for the Forest Service in Idaho, the Washington Water and Power Co., and on the electrification of the Cascade Tunnel for the Great Northern Railway. In 1929 he returned to Boston and began a 36 year-long career as an engineer for the Boston & Maine Railroad. Later he was elected to the Town of Lincoln Board of Assessors where he served for over 30 years.

Because of his fondness for the outdoors, nature, and mountains, he became president of the Appalachian Mountain Club and an avid hiker and skier.

Mr. Burckett leaves his wife, Phillippa (Patey), of Lincoln, two daughters, and three granddaughters.

He was a great friend of MIT and helped us in many ways with our class reunions. We shall miss him.

Please note my new address.—**W.O. Langille**, secretary, 20 Rogers Rd., Far Hills, NJ 07931

20 Please send news for this column to:  
**Harold Bugbee**, secretary  
313 Country Club Heights  
Woburn, MA 01801

21 Death is grievous, particularly when it mars a happy anniversary of national or personal significance. For your scribe and on behalf of all '21ers and their families, we extend sincere sympathy to **Sumner Hayward**, chemical engineering, longtime secretary-treasurer of our class, on the loss of his lovely wife, Elizabeth McCoy Hayward, four days before last Christmas.

Betty was an active alumna of Simmons College, where she was graduated in library science. The popular couple has been greatly missed at recent reunions since Betty was confined to a nursing home some years ago. She is survived by Sumner, a daughter, and granddaughter, and was predeceased by a son.

Betty was a member of the McCoy family which became famous for the popular phrase "the real McCoy" and she authored a book on the family.

You can address a message to Sumner at Wellspring House E64, Washington Ave. Ext., Albany, NY 12203.

**Edward M. Eppridge**, chemical engineering, deserves hearty thanks for prompt and excellent response to our appeal for news. Writing from his retirement home at 518 Rothbury Rd., Woodbrook, Wilmington, DE 19803-2440, he tells us that way back in that depression period when we were graduated, his first job was with Lackawanna Steel Co. in 13-hour night and 11-hour day shifts for the munificent sum of 22 cents per hour, shoveling dolomite to hit the back wall of an oven.

Less strenuous was the next job with Du Pont Fibersilk at a new plant in Buffalo, N.Y., which paid 26 cents an hour. He was singled out to work in the chemical laboratory at \$75 per month and then promoted to foreman of the operating department on transfer to a new plant in Old Hickory, Tenn. Ep remained with Du Pont throughout his working years, successively being moved to Richmond, Va.; Buenos Aires, Argentina; back to Richmond; then to Nashville, Tenn., and finally, in 1950, to Wilmington, where he has remained in retirement.

We all send Ep deepest sympathy on the loss of his wife, Theresa, in 1992 after 64 years of marriage—a coincidence in that we lost our beloved Maxine in 1993 after 64 years of wedded bliss.

Of their three children, Ep says daughter Terry has her own business in calligraphy. Son Bill is a photographer for *Sports Illustrated*. Earlier, with *Life* magazine, he was assigned to document Robert Kennedy's campaign for the presidency and was with him when he was assassinated. Bill collaborated with a writer, Hays Gorey, to publish a book, *Robert Kennedy, The Last Campaign*. A second daughter Randi also has her own business as a financial advisor.

We are in urgent need of more letters to keep this column going. Write yours immediately.—**Carole A. "Cac" Clarke**, president and secretary, 608 Union Lane, Brielle, NJ 08730, (908) 528-8881; **Samuel E. Lunden**, assistant secretary, 6205 Via Colinita, Rancho Palos Verdes, CA 90274, (310) 833-1480

22 **Martha Munzer** finds that at "going on" 95, it has become increasingly difficult to write up the class notes, so the editors at the Review office will write the report for 1922. Any new volunteers for Class Secretary?

**Edward J. O'Conner**, of 220 Andover By-pass, Andover, Mass., writes: "Thankfully, am still in good health. Amazed at the progress the Institute has made since 1922."

Sadly, there are four deaths to report. **Crawford Hallock Greenewalt**, of Greenville, Del., died September 27, 1993. **Charles J. Dettling**, course 2, of Miami, Fla., died June 18, 1993. **Harvard E. Moor**, course 6, of Jaffrey, N.H., died July 21, 1993. **John W. Strieder**, MD, of 143 Laurel Rd., Chestnut Hill, Mass., died October 25, 1993. He is survived by his wife, Denise.

Crawford Greenewalt was a member of the MIT Corporation for more than 40 years; he served on many Visiting Committees and on the Corporation



**C.H. Greenewalt**

Development Committee as well as others, becoming life member emeritus in 1977. Former MIT President Howard Johnson praises him: "Crawford Greenewalt was a rare individual—one of the leading chief executives of his time—who was also a fine scientist and a discerning humanist."

As head of the Du Pont Co. in the many years following the war, he did much to build its basic research strength, making the company one of the strongest science-based companies in the world. As a photographer and ornithologist of note, his original work on bird flight and bird song is still seen as fundamental. As a president of the American Philosophical Society, he did much to strengthen dialog and understanding among scientists and public affairs leaders. At MIT he was a great contributing member of the Corporation and we shall miss him deeply."

He began his career as a chemist and worked in four manufacturing and two auxiliary departments of Du Pont, and later served as vice-president, a director and president from 1948-1962, and finally as board chairman from 1962-67. He played major roles in the development of nylon and in the birth of Du Pont's atomic energy program.

In addition to publishing many articles on business management and economy in magazines such as *Reader's Digest*, *Fortune*, and *Saturday Review*, he drew on his varied interests in birds and high-speed photography for the 1960 book, *Hummingbirds*, which documented how the birds fly and maneuver using 70 high-speed photographs. In 1968, he published another book on that subject, *Bird Song: Acoustics and Physiology*.

Mr. Greenewalt's wife died in 1991. He is survived by his three children.

**Charles Dettling** was employed by the Lapointe Machine Tool Co. of his native Hudson, Mass., and played piano with several Hudson bands. He worked for the United Fruit Co. at the Revere Sugar Refinery,



Charlestown, for 25 years. He was an ardent golfer, an accomplished organist, and an active bridge player. . . . Harvard Moor retired in 1972 from Bangor Hydro-Electric Co. following 50 years of employment as an electrical engineer. He was a member of Lygo-nia Masonic Lodge of Ellsworth, and was past director of Ernst Manor Elderly Housing in Bangor. He was active in the Bangor Congregational Church in many capacities. He is survived by his daughter, four grandsons, three granddaughters, and seven great-grand-children.

A December 10 letter from Gregory Papadopoulos, awardee of the Class of 1922 Chair two years ago, tells of the progress in his career over the past two years and his plans for the future. Excerpting from his letter: "First, I would like to extend my deepest gratitude for this honor, and the opportunities it has created....there have been several important events in my academic career. Last year, I was designated a National Science Foundation Presidential Young Investigator, a five-year grant in support of my research program. This year, I was promoted to associate professor of electrical engineering and computer science and also received the Ruth and Joel Spira teaching award, an EECS departmental award for junior faculty.

"The biggest benefit from the Class of 1922 Chair has been a freedom in being able to pursue new research areas and to invest more time in teaching. In new research areas, I have been collaborating with an MIT theoretical physicist, Professor Kim Molvig, on new methods for very efficiently computing fluid flow problems; somewhat akin to an electronic wind tunnel....This project turned out to be quite succesful; a fundamental patent was applied for and awarded to MIT.

"My primary research focus on general purpose parallel computer technologies has also continued over this period. My research group is now in the middle of a second three-year joint project with Motorola....

"However, the biggest tangible benefits of the Class of 1922 appointment has been in the area of teaching. Over the past two years, I spent a significant amount of energy on curriculum development for 6.004, the core EECS undergraduate subject for digital design and computer architecture....I used Class of 1922 funds to employ MIT undergraduates in the redevelopment of the lab components, and to purchase computing resources for their work....

"Before I close, I would like to briefly summarize my plans for the next several years. The biggest change is that, for the next 18 months, I will be on leave from MIT to be the senior architect at Thinking Machines Corp., one of the leading companies in massively parallel architecture....I have been given the primary responsibility for creating the architecture for Thinking Machines' future products. So now my research in parallel computing can be used in practice. Thinking Machines is right across the street, so I still keep a strong contact with the Institute and continue to supervise my graduate students' research. I hope to return to MIT with a fresh perspective of how to more effectively bridge academia and industry, not only for 'technology transfer,' but also in the way in which we teach undergraduate engineering."

In closing, Professor Papadopoulos thanks

the Class of 1922 for their generous support: "You have made a lasting impact on my academic career."—ed.

## 23

These notes are being written a few days before Christmas. It is especially sad to have to report deaths at this time of the year.

On November 5, Fred Almqvist passed away. Fred was our secretary-treasurer for a number of years and kept us informed of the activities of the class.

Lester B. Bridaham passed away but I do not have any details. . . . Eugene B. Mechline died May 13, 1992. He lived in Lakewood, Colo., and is survived by his widow, Mary. . . . Daniel G.B. Thompson passed away July 20. He was a professor at Trinity College and is survived by his widow, Anne.

I received a Christmas letter from our vice-president, David Joy. He is moving from apartment #665 to Apartment #1010 at the same address as before.

The weather is beautiful in Vero Beach—come on down.—Royal Sterling, secretary-treasurer, 2350 Indian Creek Blvd. W., Apt. 201D, Vero Beach, FL 32966

## 24

### 70th Reunion

I received a delightful and informative letter from Phil Blanchard. We are hoping his

letter will start a trend. Just so you will know with whom we are dealing in the day of computers and electric typewriters, the letter is written quite legibly in long hand.

Phil starts out by telling us he is 93 and his doctor told him after a check up that he is a "young 93."

He points out that the tuition was \$300 when he and his older brother Carl, '18, attended MIT. "Being country lads of the farm, an uncle of ours had to help us through MIT, so we were both especially grateful for the honor MIT bestowed on us for the rest of our lives, and did our best to pay it back."

Phil continues, "On leaving Tech I spent the next three years at Alco, Schenectady, taking a special three-year executive course. For the next 23 years I was with the Locomotive Superheater Co., in New York City, starting in engineering and ending up in 1950 as national service manager for all the United States. In my early days the superheater did marvels for the transportation industry as the steam locomotive was the only means of mass transportation during the rapid expansion of the United States westward. The superheated locomotive was relatively short lived and no one had ever perpetuated the names of the executives that were responsible for it. At 90 and from memory I produced such a hard cover book called, *The Superheater Co. and Its People* which besides listing them, is a brief story of its operation at home and in the field. This book is now in the MIT Library and also in the Department of Interior's 'Steamtown, Scranton, Pa.' for posterity.

"In 1950, I joined my two older brothers as engineer and manager of their deep water wholesale oil and coal terminal which was growing fast. On retiring in 1983 as director

# ClassNotes

and senior VP, I had supervised increasing its capacity from 600,000 BPL to 2,300,000.

"But what I want to tell you is about what Carl did for MIT in his day and what I have done and you can too, in this day of high capital gains and extremely low interest on new tax exempt bonds. If you contact Frank McGrory at MIT, (617) 253-4081, he will explain how you can make a donation to MIT of such securities and at your age get 11 percent and 12 percent for the rest of your life or for both you and your spouse's life. Besides you get an IRS income tax write off on 50 percent of your charitable gift to MIT. Do it today."

Louis Tanner, 93, formerly a chief chemist of the U.S. Customs Laboratory in Boston, died on May 9, 1993. He came to New York from his native London as a small boy. His BS in chemistry was from City College followed by the SM in chemical engineering from MIT in 1924. He became an authority on test methods for products entering the United States and the ASTM recognized him with an award of merit in 1960. The U.S. Treasury Department gave him its exceptional civilian service award in 1949 and the Albert Gallatin Award in 1969 when he retired. The congressional record states that he was, "a man unique in the annals of the Federal Civil Service whose accomplishments constituted a unique contribution to the government and to the industry of the U.S. and abroad." It is not known if there are any survivors.

A newsclipping informed this writer that Austin G. Cooley died September 7, 1993. He was in his home at the time and the cause of death was a stroke according to his wife, Helene. Austin was the inventor of the fax machines that we all use today. He held more than 75 patents on methods and equipment for the transmission of weather maps, medical x-rays, and facsimile material as well as pictures. Beginning in 1935, he served in a series of technical and executive positions with various subsidiaries of the New York Times Co. He left the parent company in 1959, when he was the executive vice-president and manager of the Times Facsimile Corp. That year, the corporation was sold to Litton Systems, Inc. After leaving the New York Times Co., Austin served as vice-president and consultant at Litton Systems until 1970.

In 1935, Austin achieved the first transmission of news photographs of survivors of the ill-fated dirigible *Macon* for the *Times*. The Navy dirigible exploded over the Pacific ocean, killing two people. The pictures were from wide-world wirephoto, a *Times* news service for which he designed and built photo-facsimile equipment for the transmission of news photographs.

During World War II, Mr. Cooley, then manager of Times Telephoto Equipment, Inc., another *Times* subsidiary, was honored along with the company by the War Department for the development of ways to send weather maps by radio waves and telephone lines. It was to be the forerunner of today's worldwide daily weather maps.—Co-secretaries: Katty Hereford, 237 Hacienda Carmel, Carmel, CA 93923; Col. I. Henry Stern, 2840 S. Ocean #514, Palm Beach, FL 33480



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# 25

Melvin Shikes writes from Sun City, Ariz. He sold his store in Chestnut Hill in 1968 and moved to Sun City intending to retire. But after three months he tired of all

play and went to work for the Hammond Organ Co., and when that company moved out went with the Baldwin Piano and Organ Co. About six months ago he decided to actually retire and is now playing tennis every day, keeping involved in Scouting (60 years), several musical organizations, and amateur theater. When temperatures reach 100 degrees, he spends three months in Prescott, Ariz. Mel has a daughter and son, both married. The daughter and husband will retire in a few years and plan to move to Sun City West. He describes his son as a "feet in cement New Englander." Mel describes his youngest grandson as a whiz kid who, with much urging from his grandfather, has applied for admission to the Institute in 1994. He sounds like the kind of young person MIT is looking for.

Milt Salzman is still quite active. He recently recovered from prostate surgery and last September 25 celebrated a "90/60 Birthday Bash." Milt turned 90, and his son Roy, '55, reached 60. It was a gala event with 20 family members present, 21 friends and neighbors, and 22 Barbershop Chorus members. He still continues with his singing organizations. He planned to spend Thanksgiving with his granddaughter on Cape Cod and Christmas at his son's home in Rockport, Maine. He hopes to make the 70th in 1995.

Don Taber reports that 1993 has been an active year. He attended weddings of two granddaughters, went to England on the QE2, spent six days in London, six days in the Lake District, and came back on the Concorde.—F. Leroy "Doc" Foster, secretary, 434 Old Comers Rd., P.O. Box 331, North Chatham, MA 02650

# 26

Clinton B. Galphin of Raleigh, N.C., reports that he celebrated his 90th birthday on May 2, 1993, and his 65th wedding anniversary on November 3, 1993, and that

he is still active and in his own home. . . . Robert M. Glidden of Portland, Maine, died September 24, 1993. He was employed by Texas Instrument Co. for 38 years, retiring in 1967 as manager in the Kentucky office. Surviving are his wife of 65 years, Evelyn, five grandchildren, and four great-grandchildren. . . . Professor Alan K. Laing of Urbana, Ill., died May 25, 1993. Both he and his wife were active in many charitable endeavors.

G. Warren Hamblet, Jr., of North Andover, Mass., died October 18, 1993. An industrialist and lifelong participant of civic and charitable organizations, he worked at the family-owned Hamblet Machine Co. in Lawrence for 40 years. He served as president and CEO from 1955 to 1968, when the company was sold to Southworth Machine Co. of Portland, Maine. He continued as a consultant until his 1975 retirement. He was instrumental in the development of Hamblet paper cutters, many of which are still being used in paper mills throughout the world. He

formed the Lanam Club in Andover, and was involved in the development of many youth organizations. He was a past president of the Lawrence Rotary, past president of the Lawrence Boys Club, past chair of the Advisory Board of the Salvation Army, a charter member of the Lawrence Chamber of Commerce, a former trustee of Lawrence General Hospital, and a former member of the YMCA. He was a director of the Broadway-Essex Savings Bank and the Bay State Merchants National Bank, and a town meeting member. He is survived by his wife, Gernella, and several children, grandchildren, and great-grandchildren.

Dorothy Quiggle, the first female Penn State Engineering PhD and professor, died August 28, 1993. Upon graduating from MIT, she was brought to Penn State to establish new courses and a laboratory in chemical engineering. She was instrumental in establishing both the Department of Chemical Engineering and the Petroleum Refining Laboratory at the school, where she carried out most of her research. She was the author and co-author of numerous papers on petroleum chemistry and analytic tools. She held a 1939 patent for a solution to rapidly remove free oxygen from gases. She retired with the rank of Professor Emerita of Chemical Engineering. She was on the boards of many professional organizations and on the board of directors of the American Cancer Society of Centre County for 30 years. She was also a member of the board of directors for Meals on Wheels. There are no survivors.

Please send news to—Donald S. Cunningham, secretary, Eventide, 215 Adams St., Quincy, MA 02169, (617) 328-1840

# 27

Maurice James keeps well and strong working on his tree farm in Northwood, N.H., which was recognized as one of the best in the state. He produced hundreds of loads of

wood chips from his farm. He returns to his home in Milwaukee for the winter months. . . . Edward A. "Ted" Leach and wife Betty of Springfield, Ill., took a trip to Birmingham, Ala., for a family rendezvous. "Of my generation: only two male cousins of mine. This was a happy occasion for all of us and our spouses to put together the bits and pieces (of our lives) we could remember."

Walter E. Caunt, 89, of South Yarmouth, Mass., died on October 7, 1993, of heart failure. He was employed by the town of Wellesley Public Works Department as a civil engineer for 36 years. After retirement, he continued in private practice until moving to Cape Cod in 1989. Walter was a life member of the Massachusetts Association of Civil Engineers and Land Surveyors. He was also a veteran member of Grand Masonic Lodge of Massachusetts; a deacon in the Trinitarian Congregational Church of Wayland, and a member of the MIT Club of Cape Cod. He is survived by his wife, Marion, a son Bradford, two grandchildren, and two great-grandchildren. We send our condolences to his family.—Joseph C. Burley, secretary, 1 Harbourside Dr., Delray Beach, FL 33483; Lawrence B. Grew, assistant secretary, 21 Yowago Ave., Branford, CT 06405



28

At this time of writing, with a deadline date of December 24 and the imminent arrival of a new year, there are a few sobering notes. A telephoned report from **Abe Woolf** of his attendance at the funeral service for **Frances (Mrs. James) Donovan** on Friday, December 17, 1993, was followed by a copy of her obituary from a Boston paper.

Our class was blessed for many years with exemplary performance in Class of 1928 activities by **Fran and Jim Donovan** working closely with **Florence and Ralph Joep**. **Ralph**, our first president, died while on a business trip preparing for a reunion and was followed as president by **Jim Donovan**, who passed away in 1987. **Florence** married our third president, **Walter Smith**, who died in 1990, to continue a dedicated career of service to MIT and is now making slow recovery from a stroke suffered in 1993. We all share the sorrows with the families and friends of **Ralph, Jim, Walter**, and now **Fran**, and we wish **Florence** a return to health. At the same time we can take great pride in the traditions they founded, followed, and forwarded to the Class and Institute.

**Frances Donovan**, in addition to her interests in the Class of '28 and MIT, has been an alumnae president and a trustee of Radcliffe College, her alma mater, and the recipient of their Alumnae Achievement Award together with appreciation for all her efforts. She earned many degrees at Radcliffe and Simmons College, and was a trustee or corporation member of many hospitals and nursing activities.

This month there are also two other class deaths. **Edward Hartshorne** of Ft. Myers, Fla., passed away on September 15, 1993, and **Elmer Frederick Griep** on October 20, 1993, at Grants Pass, Ore., but no further details are available at this time. We grieve with all families, classmates, and friends of the above.

We can read, with interest and pride, the recent letter from our treasurer and class agent **George Palo** to all '28ers that we are strong supporters of MIT. And what changes we have been privileged to participate in or witness.—**Ernest H. Knight**, secretary and president, Box 98, Raymond, ME 04071

29

## 65th Reunion

Please send news for this column to: **Karnig Dinjian**, secretary, P.O. Box 83,

Arlington, MA 02174; phone in Florida: (407) 395-2890

30

In the February/March '93 issue we reported that **Joe Kania**, our oldest survivor, was planning an extensive trip to Europe including a visit to Vienna where he was born in

1901 and lived until his family moved to Canada in 1913. We have now received **Joe's** report on this junket. He and his second wife, **Florence**, flew to London, then boarded the *Crystal Harmony* for a cruise around the North Cape to Murmansk and back to Copenhagen. The next stop was Vienna, where **Joe** has quite a few relatives. A high point of the

trip appears to have been their stay at the Hotel Intercontinental where they "gave a lovely dinner for about 24 relatives at which we also celebrated, balloons and all, **Florence's** 80th birthday!" They in turn were entertained at a "Heurigen" and at a "Hungarian restaurant with lovely genuine gypsy music, cymbal and all!" Since their return to Vancouver, **Joe** has kept busy playing the violin, swimming for exercise and attending symphony concerts and plays. How many of us at age 92 will be able to maintain such a schedule? . . . As previously reported, **Arthur Wildes** retired some years ago after a career as a teacher and administrator in the Utica, N.Y., public schools. After his first wife died he married **Gladys Bell**, who accompanied him to our 55th reunion. In 1991 they moved to **Sherman Brook Village**, a home for independent living in Clinton, N.Y. Since **Gladys** passed away in 1992 he has continued to live "in this comfortable place." . . . **Doris and Leslie Engler** are still shuttling between **Quechee, Vt.**, and **Ft. Lauderdale, Fla.**, and doing volunteer hospital work at both places. He says they plan to move their northern terminus from Vermont to Connecticut to be nearer their families.

We have at hand notices that we have lost three more of our classmates: **Paul Kimberlin** on July 26, 1993; **Cyril Harding** on August 16 and **Charles Hamilton** on September 29. . . . According to my records, **Paul**, at the time of his retirement in 1973, was working as a senior engineer in charge of materials handling equipment for **Inland Steel Co.** in **East Chicago**. After his retirement he and his wife, **Lucille**, moved to **Pearce, Ariz.** During his retirement years he owned an RV in which he traveled quite extensively. In the winter, when **Louise** and I were at our **Green Valley, Ariz.**, home, **Paul** and I used to see each other fairly often, since we both attended most of the meetings of the MIT Club of Tucson. My records indicate that **Lucille** died more than 10 years ago. Those of you with long memories may recall that the **Kimberlins** brought their son **Kenneth** to the 35th reunion. **Kenneth**, who reported his father's death, works for **Bethlehem Steel**.

**Cyril Richard Bennett Harding** was born in **Torquay of Devon, England**, and came to this country with his parents in 1912. During his years at MIT, he was a member of the swimming team and rifle team, as well as the bow oar of a junior varsity crew that enjoyed considerable success in the mid-'20s. In the '30s he worked for the **Lynn, Mass.**, Parks Department, of which he became chief engineer. In that capacity he designed and built an innovative cantilevered-roof grandstand for what were then the **Lynn (Boston) Red Sox**. At the onset of WWII he became assistant director of engineering of a division of **Great Lakes Steel Co.**, where he designed a number of novel items, e.g., light-weight steel floats used by the Navy as floating dry-docks, floating piers, wharves, and bridges. He also appears to have been the designer of the famous **Quonset** huts that were extensively used in WWII. His post-war jobs included **Middle East** manager for **Johnson Pump** in **Athens, Greece**; senior design engineer at **North American Aviation**; and founder of **Peerless Investment Corp.**, a real estate and investment company in **Hollywood, Calif.** At one time he was commander of the **Los Angeles** chapter of the **U.S. Power Squadron**. He is survived by his wife, **Joanna**;

# ClassNotes

a daughter, **Joanna Candice**; three sons, **Richard, Robert**, and **George**; and six grandchildren.

**Charles Hamilton** did his undergraduate work at **Northeastern** and received an SM in chemical Engineering from MIT in 1930. He was a 20-year veteran of the U.S. Navy, serving in both WWII and the Korean war. In later years he worked as a chemical engineer for **Phillip Bros.** in **Holbrook, Mass.**, from which job he retired in 1979. He is survived by two daughters, **Maureen** and **Kelly**—**Gordon K. Lister**, secretary, 5707 **Williamsburg Landing Drive #40**, **Williamsburg, VA 23185**

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Please send news for this column to:  
**Wyman P. Boynton**, secretary  
668 Middle St.  
**Portsmouth, NH 03801**

32

Please send news for this column to:  
**Melvin Castleman**, secretary  
163 Beach Bluff Ave.  
**Swampscott, MA 01907**

33

Although **Althea** and **John McAleer** were at the 60th Reunion for part of the activities, **Althea** writes that **John** did not meet any of his friends there. Although **John** has

**Alzheimer's**, she says he really enjoyed being with us. Quoting from her letter, "Before the onset of **Alzheimer's**, he was active in **Rhode Island's 'Save the Bay' project**, **North Kingstown's Conservation Council**, and many other committees. . . . a very well-known and active yachtsman, he is still sailing in evening races at the local yacht club. He has a devoted crew and with their help he took 1st place in his class." **John's** professional career is briefly recorded in the 60th Reunion Redbook. The **McAleers** are at home at 60 **Elam St.**, **Kingstown, R.I. 02852** if you would write him; they would like to hear from others in chemical engineering, class of 1933.

**Arthur Hungerford** writes that he and wife **Helen** are among the "crazies" to have moved three times within one year. Now they are ensconced in "downtown" (**Penn.**) **State College** enjoying home-cooking which had eluded them up to the present. **Art** has not been teaching for some time but says he helps out at the **National Cable Television Center and Museum** and at the **Art Museum** there. Although the **Hungerfords** arrived at **Penn State** in 1961, they seem to be able to keep pace with the growth of the college and its nearly 100,000 capacity stadium and many more important activities. Daughter **Gale** and her husband rule over a nearby **Rod and Gun Club**. **Hungerford** for news from "any of you" '33 graduates and if you are close, **Art** says to look them up. A final P.S. asks, "Are there any more **Phi Mu Deltas** of our era still around?" (Note: **Art** is a Course XV, business and engi-



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Robin B. Dill, '77  
Andrew F. McKown, SM '78  
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Elliott I. Steinberg, SM '80  
Chris M. Erikson, SM '85  
Gretchen A. Young, SM '86  
Cristian De la Huerta,  
SM '87  
Alec D. Smith, PhD '89

neering administration graduate. Their address is: The Towers, 404, 403 S. Allen St., State College, PA 16801.)

Although quite timidly I have sought everywhere but the right place to get Ivan A. Getting's autobiographical book, *All in a Lifetime*, I have not continued my search for the book. Instead I opted to refer to *American Men & Women of Science 1992-93*, 18th Edition. In the 60th Reunion Redbook (my Class Bible) Ivan says, "I cannot put a lifetime in a halfpage." Yes, yes to that. Ivan's great service to his country beginning with his MIT SB is most laudable and as one of the Class of '33, as one of us, we've got to be very honored he was here with us. If you don't already know of Ivan, try the references above. Best wishes.

Harry J. Sommer (Course XV) writes that he would have made the 60th Reunion except that he and wife, Cele, were "pretty well banged up" in a car accident and felt they shouldn't try getting there. Harry made my secretarial day by saying how much he admired Calvin Mohr although seeing him but a few times in various places. Cal would find Harry and either call or visit with him. Harry confirms that Cal was indeed a good-will ambassador and a friend. Harry wished that since Calvin was no longer with us that others would also recall Calvin who left an indelible impression on his other classmates as well. Quite interestingly, Harry and I have been together at and away from MIT but we have never met. Harry also is a Bostonian and began with the Class of '32, so we both put on those dinky old uniforms parading around together as freshmen ROTC captives. Harry then left for one year to return with the Class of '33. Harry (a baritone) was business manager of the Glee Club for three years. I was there with him but as a second tenor. Harry's wife, Cele, and I attended some of the same elementary schools in Dorchester, I much earlier. Harry's career began with a job at Filene's (not the basement) at \$15.75 weekly. (What did you make when you left MIT in 1933?) Harry worked for the Lerner Shops in New York City for 38 years and thereafter spent some time in Detroit. You guessed it, I worked in those two cities though this time probably not at the same time. Today Harry is 20 minutes away from me and I find that he and I frequent the same 'digs' and yet we have never met. It will happen sooner now.

As I write this the snow has finally fallen and Christmas is three days away. Best wishes for all these remaining days of this New Year, 1994. Continuing, I have received notes from several classmates. Ed Simpson and wife Ida write from their Florida island resort to say how much they enjoyed the 60th and seeing me after all the years when Ed and I were at Rogers architecting. . . . Len Julian and wife Doris sent me their family's annual letter saying I could take it from there. Len, outside of the MIT references there is a puzzlement as to who Andrea, Pat, Sam, Isaac, Rebecca, Rodney, Sheryl, and Asher are so I can't comment on their many activities. I do want to thank you for the kind words about your pleasure with the happenings after the 60th and my first report for the *Tech Review*. Also, I wish to say that Doris and you looked as healthy as anyone at the Reunion so that when you say both your healths have improved, the rest of us had better catch up. . . . Then there is the irrepressible Dick Fossett who inflates my ego

every which way he can. And wife Charalee is no different. I am not divulging any of it except to publicly thank them. You are both a joy! If any of you are in Paris in February you might look up the Fossetts. Their son Steve is an entrant in an auto race from Paris down through Africa.

In a quite different way I wish to say a few words about the four classmates who have left us this year of 1993, although I came to know only one personally.

Charles F. Payne (Course X) passed away on February 9, 1993. This was a very special person whose life is briefly and posthumously described in the 60th Reunion Class Book. At age 15, he was offered scholarships to both Harvard (archaeology) and MIT (engineering). Entering MIT at age 16, he graduated with the rest of us (but I am sure not quite the same). He began and ended his career with Eastman Kodak after 42 years there, finally as superintendent of their Paper Mill Division. However his interest in archaeology never did leave him and he was involved voluntarily on many projects including a Williamsburg project and for the Rochester Museum of Science to whom he donated a large collection of masks he had collected during four world trips. They are there in their Hall of Anthropology. Charles' survivors include his wife of 59 years, Marcia Lane Payne, three children, and eight grandchildren.

Robert G. Holt (Course IX-B) passed on August 30, 1993, with obituary notices in the *Times-Argus* (Barre, Vt.) and the *Free Press* (Burlington, Vt.). Robert also had many interests besides his lifelong career with National Life Insurance with whom he began employment after graduation, retiring as treasurer of the company in 1974. An ardent sportsman (hunting, fishing), he also found time for music as treasurer for the Vermont Conservatory of Music and playing with the Capital City Band for a great many years. Survivors are his wife, F. Margaret Parrott, whom he married in 1935, and also two daughters, and six grandchildren.

Richard C. Molloy (Course XVI) passed on October 2, 1993. In our 60th Reunion Class Book, Richard wrote so very briefly that what he has left out would perhaps make a book by itself—so it was left out. But he did say that he and wife Jane had planned to make the 60th but at the last minute they had to cancel. He has had a varied and interesting professional life. Indeed, with United Aircraft as an executive engineer he developed several patents. He also has written for many popular and scientific journals. An avid outdoorsman he loved boating, color photography, and Maine. Wittily he related how he and a few classmates at MIT were putting together a two-seater airplane (TX33), trying to complete it before graduation but lacking for wood wings, the plane was never finished. His saying then "Sorry, end of story" is as meaningful as it was then.

Ferdinand M. Johnson (Course II) passed on September 3, 1993. I don't know how to begin. Ferd was 60th Reunion Committee Chair, and was accompanied by his wife, Alice. He did everything he could for the 60th Reunion. In his biography in the Reunion Class Book he says he did everything in the textile business, except knitting. Starting with textiles Ferd first worked with Nawnkeg Steam Cotton, Salem, Mass., claiming the



introduction of polyester-cotton fabric in 1939. Conjointly with Du Pont he came up with a fiber known as Orlon. In the year 1940, still single, Ferd was drafted back private to the Yankee Division. He was one of only two who were commissioned during his time with that Division. The Yankee Division then went with the American Division which served gallantly in the Battles for Guadalcanal, Bougainville, and Layete. Ferd's unit received a Presidential Citation for his part. Home in 1945, he married Alice Butler Done. Alice D., a son, and a daughter are known survivors. Ferd left his autobiography blank after his army career but I am sure most of you know it by now. I only knew him at the 60th Reunion and in correspondence prior to the Reunion and in that time I learned of the extreme sincerity in everything he undertook for that Reunion. My last handshake with Ferd after being selected for class secretary was as strong an admonition to me to do a good job as anyone could have given me. We who knew him will remember.

Lastly, there have been numerous inquiries as to the women of our class. To my knowledge there are six very trend-setting careers out there, four being Course IV classmates of mine. Won't you write, please.—**Berj Tashjian**, secretary, 1245 Briarwood Lane, Northbrook, IL 60062, (708) 272-8683

# 34

## 60th Reunion

Please send news for this column to: **George Bull**, secretary, 8100 Connecticut Ave., Apt. 919, Bethesda, MD 20815

# 35

**Charles D. Hanley** writes from his home in Berlin, Md., that he has been living there since he retired 15 years ago. His wife, Marie, is active in real estate. Charles uses a

rowing machine to help keep himself active. His son is an editorial page editor for a local newspaper on Long Island where he lives with his wife and son. His daughter with her optometrist husband and five more of Charles' grandchildren moved to Maine from New York last year.

**George Lykos** writes from his home in La Jolla, Calif., that since retiring he has become a professional artist and has held 32 one-man shows. (I attended one of his first shows in La Jolla about three years ago, and found his work extremely interesting.) . . . **Ben Blocker** and his wife celebrated their 55th wedding anniversary last February. In October they left on their annual trek to Israel. His oldest grandson Richard will receive an MD degree this June. His oldest granddaughter Debbie is a tennis pro at Longfellow Tennis Club in Sudbury, Mass.

**Harold Everett** travelled to Cape Cod and Boston to attend New England Historic Genealogy Society meetings last June and September, from his home in Flagler Beach, Fla. He visited his younger son Peter, an attorney, and grandson in Fairfax, Va. His daughter and family and older son and family visited him in Florida last summer. Hal is keeping well and active in his city's affairs and the

Sons of the American Revolution and the Society of Mayflower Descendants. (My descendants were on the same boat!)

Last summer **Lester A. Brooks** won two golf prizes at one of the W/W GA Seniors for nearest the hole on a par 3, and low gross (91) in his flight. The following month he was ready to repeat that sterling performance but ended up with a 114. The weather was so dry last summer that they did not even bother to try to have a garden. He said he mowed the grass only once or twice. His wife, Ellen, is doing just fine, but Les had a setback that landed him in the hospital for a short stay. He would prefer to do his recuperating near the warm waters of the Caribbean but is doing okay at home.

I regret reporting on the deaths of 11 of our former classmates: **Brydon Greene** died February 16, 1993, at his home in Cashiers, N.C., and is survived by his wife, Joyce. **Herbert C. Thomas**, Course VI, died March 4, 1993, at his home in Wayne, Pa., and is survived by his wife, Doris. **Frank B. Matthews**, Course I, died April 2, 1993, at his home in Petersburg, N.Y., and is survived by his daughter, Whitney M. Shunk.

**James J. Glenn** died July 26, 1993, at his home in King of Prussia, Pa. He served as a lieutenant in the Navy in World War II. In 1945 he joined with his co-researcher at MIT and founded the Glenn-Killian Color Co. in Philadelphia manufacturing lithographic and offset printing inks. He is survived by three sons, a brother, two sisters, and six grandchildren. . . . **Arthur C. Marquardt, Jr.**, died July 31, 1993, at the Norwood Hospital. He served in the U.S. Army in World War II. He spent 45 years with C.E. Crowfoot Co. as mechanical engineer in South Boston. He is survived by his wife, Elna, a son, two daughters, and five grandchildren. Arthur participated in the 25 years of the Class Golf Tourney.

**Joseph L. Haggerty**, Course X, died September 4, 1993, in Catholic Medical Center, Manchester, N.H. He served in the U.S. Army in India in World War II and retired as a captain. He was a chemical engineer with the American Cyanamid Co. of New York City in Linden, N.J., and Wayne, Pa., for many years. He is survived by nieces and nephews. . . .

**Harold William Parker**, Course VIII, died September 27, 1993, at the Littleton Nursing Home in Littleton, Mass. He was a metallurgist with IBM in Rochester, Minn.; Pitney Bowes in Stamford, Conn.; and Taft Pierce in Woonsocket, R.I., retiring in 1976. He was also a participant in the 25-year Class Golf Tourney. He is survived by a son, two daughters, and six grandchildren.

**G. Frederic Lincoln** died October 2, 1993, at his home in Onset, Mass. He was a retired sales manager for the E&F King Co. of Norwood and before that had been the New England district manager for Allied Chemical Corp. He is survived by two daughters and two grandchildren. . . . **Louis C. Maspero**, Course IV, died October 5, 1993, at his home in North Quincy, Mass., and is survived by his wife, Elizabeth. . . . **Sidney V. Fox**, Course X, died November 12, 1993, at St. Lukes Hospital, Bethlehem, Pa. He retired as senior research engineer at Bethlehem Steel Co. in January 1978. He earned a master's degree from Lafayette College in 1946. He is survived by his wife, Gertrude, two sons, and a grand-daughter.

# ClassNotes

**Samuel P. Brown**, Course XV, died December 6, 1993, at the South Port Nursing Center, Port Charlotte, Fla. He served as a major in the Army Air Force in World War II. He joined Coverdale & Colpitts in 1945 and retired in 1975 as partner and chairman. He moved to Punta Gorda, Fla., in 1983 from Short Hills, N.J. He participated in the 25-year Class Golf Tourney. He is survived by his wife, Natalie, a son, a daughter, and seven grandchildren. Our class total is now down to 246. Please write now and tell what you're doing.—**Allan Q. Mowatt**, secretary, 715 N. Broadway, #257, Escondido, CA 92025-1880

# 36

On an October visit to a grandson at Denison in Ohio, I saw **Walter Seinsheimer** in Cincinnati, and **Frank Danforth**, **Jim Baker**, and **Bob Van Patten-Steiger** in Ken-

tucky. **Walter** (Course VIII) was with us only one year and transferred to University of Pennsylvania for one semester. Then, without formal training, he struck out for himself in management consulting, winding up as arbitrator in labor disputes with great success. On a pleasure trip to the Far East he spoke to the Japanese Chamber of Commerce (through an interpreter) on request of the American Arbitration Association, and also at Hong Kong. A photographer since boyhood, he has won numerous prizes and medals, and exhibited in one-man shows. He and wife Betty enjoy a condominium high on a bluff overlooking the commerce-busy Ohio River. They had a party of 22 on his 80th birthday.

**Frank Danforth** joined our class as a junior in Course XV, with a bachelor of arts degree from Williams, and affiliated with Number Six Club (Delta Psi). He crammed chemistry for six weeks under Dean Pitre, and recalled being a guest at **Marvine Gorham's** home in Buffalo. While living in New Canaan 1945-53 he visited **Tom Johnson** there, and ushered at **Edgar Rust's** wedding in Virginia. Frank tired of the metropolitan business world, and took up egg production in Connecticut with 2,000 chickens. He figures that in 13 years he processed and peddled 6 million eggs! Then in 1966 he and wife Elizabeth moved to her family home in Paris, Ky., where he operated two cattle farms in this lush area of bluegrass and horse breeding. They told of a retired neighbor down the road—"Secretariat" of Triple Crown fame: "a real ham—he would prance up to meet any human visitor approaching the fence."

**Anne** and **Jim Baker's** arts-center project at Madisonville Community College (January '92 Notes) is a great success! A busy schedule of symphony, piano, ballet, live theatre, and art exhibits fills several pages of the '93-'94 season bulletin. And the outstanding acoustics of the concert hall—for performers as well as audience—prompted members of a visiting symphony to exclaim: "For the first time in our travels, we can hear the flutes!" Jim's paralysis is about the same as on my visit in '91, but his and Anne's perseverance is an



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inspiration to family and friends. Anne got a small TV rigged similar to a dentist's X-ray machine, so the TV picture can be where Jim's head position and eye focus require.

When I called Bernice and Bob Van Patten-Steiger in Elizabethtown, Ky., their response was "and of course you will stay overnight." So we had much time for reminiscing, and I'll save some notes for a future issue. Bob was Course V, and for 25 years was in manufacturing, sales, and technical management of rubber and plastics industries. In 1962 he formed a personnel consulting firm specializing in building good team situations for clients, and he retired in 1980. At the Institute Wayne Hazen (Course VIII) and Charles Milone (Course V) were his buddies, and he corresponds periodically with Mal Graves (Course XV). Bob was goalie in ice hockey at Exeter and Tech, despite having lost the use of one eye in a childhood accident. And now as we talked of it, I would never sense it. Bob's wife, Mardie, died in their 42nd year of marriage, and he married Bernice in 1981. They have raised a grandson from age 3 who could read when entering kindergarten, and now at age 15 has an IQ of 140.

In a note last spring to the Alumni/ae Office Connie Bouchard told of switching from restoring classic cars to making replicas (every component) of early English skeletal clocks. He had finished seven, with a goal of ten—one for each child and grandchild. On request he sent me photos of both cars and clocks, all beautiful and intricate, and wants anyone coming near 579 Tooting Lane, Birmingham, MI 48009 to see them, at any time. He holds open house weekly for Detroit area car buffs. I hope he and wife Helen will bring one of each to our 60th, and George Trimble his miniature V-8 engine.

Also to the Alumni/ae Office a note from Homer "Jim" Webster: "Still going strong," but on the telephone he told of wife Anne breaking her hip in a fall and needing three operations. They will sell their Kauai winter home, although it has been fully restored, and avoid travel from Kirkland, Wash. Contrary to my earlier report, the 40-foot long, 2 1/2-foot-deep laminated central girder of the roof did not fail, despite supporting eight fallen or snapped ironwood trees of 1 1/2 to 2 1/2 feet in diameter. . . . A note from Wiley Post regrets our not connecting at his home as Phoebe and I returned from Virginia. Allentown's 41st annual Festival of Bands was dedicated to Wiley, honoring his "commitment which has made this event a continuing success."

Pat Patterson reports Alice Kimball's mini-reunion October 23 a fine success, in good weather. Attending were the Arnolds, Assmans, Doggetts, Grossmans, Mackros, Shainins, Tremaglios, Bernie Vonnegut, the Pattersons with daughter Marcia and Alice's daughter Martha. Pat has done a super job of culling news and recollections, which I will cover in the coming winter months for the May/June and July issues—also letters to Alice from several who could not attend.

Cheers for the life of Ellington "Duke" Wade, who died of cancer September 3, 1993. Duke was Course XIV—electrochemical engineering—and spent 39 years in metals research with Scovill Co. in Waterbury, Conn. He retired in 1975. On the telephone his widow, Bernadine, told of their 50th wedding anniversary in 1989 and his painting of scenes in oils:

"He was very modest about his hobby, but I think the works are quite good." During active life he pursued gardening and photography, and was a district commissioner of Boy Scouts of America.—Frank L. Phillips, secretary, 1105 Calle Catalina, Santa Fe, NM 87501, (505) 988-2745; James F. Patterson, assistant secretary, 170 Broadway, Pleasantville, NY 10570, (914) 769-4171

# 37

Your assistant secretary is sorry to report that, at the time these notes were prepared, Bob Thorson was recovering from a heart attack suffered a few days earlier. We all hope

and expect that by the time you read this, he will be back in the swing of things.

Bob Rudy and his wife, Joan, have been active in the Council of the Arts at MIT and attended the last meeting in October. Bob reports that two awards were given for excellence and innovative design in architecture—one to a MIT faculty member and the other to a firm outside the MIT community. "The meeting was very well attended and the impact of humanities on the student body has been quite startling and exciting," says Bob. After the meeting, Bob hosted a mini-reunion dinner of '37ers, including Phil Peters, Bob Thorson, and Dick Young, all of whom are looking forward to the next get-together.

It was no surprise that Dick Young commented to your secretary, "Apart from the noise of the so-called band, last night was fun and overly generous of the Rudys." Dick also announced the marriage of his daughter Pam. It was in Denver, and again '37 was represented. Phil Peters and his wife Ruth made the long trip to be at the ceremony.

Dick and Phil, as previously reported, both live at the life-care community Fox Hill Village in Westwood, Mass. Dick and Marge want everyone to know how great it is. He writes: "Most of you know so little about it. You imagine the worst—that we have given up on life. Not true at all. It just makes it easier to do all we want without the interference of household chores. We welcome any of you to come for a day and night (we have private guest suites at no cost to you). I think your eyes will be opened." Or, better still, says your writer, make a two-day trip of it, visiting Genevieve and Len Seder at Brookhaven at Lexington, also a life-care community half an hour away and also with overnight guest suites. We heartily agree that many people have misconceptions and welcome the chance to help make Dick's point.

Duane "Woody" Wood, retired president (1976) of Lockheed California Co., has been enjoying his "semi-retirement" as president of the CLC Consulting Corp. He has been helping Westinghouse Airships Division sell to international and domestic customers. "This is quite a change for me, from selling SR71s (the fastest aircraft in the world) to selling airships. I also do work for other European and U.S. companies, which involves travel to Europe, the Middle East, and Asia. My work schedule takes only half of my time, so I can spend the rest helping my granddaughter and grandson grow up. Unfortunately, I lost my older daughter to cancer last year."

For someone retired over 20 years ago, Chester Kyih-z Nie of Shanghai has a plateful



of activities. He is regularly asked to meet with foreign visitors, particularly from companies looking to do stories and movies about the history of Shanghai. Recently, reps of the Australian and Japanese Broadcasting Companies were among them. The Japanese wanted to locate the former residences of the Soong family, around 50 to 60 years ago. Says Chester: "Fortunately, my indistinct memory did not fail to fulfill their requirements."

Vernon Kreuter, Jr., of Naples, N.Y., recently retired as general manager of the McGraw Edison Co. in Rochester, N.Y. He divides his time among the seven grandchildren of his four children, leaving some time for photography, sailing, and golf. He has traveled in South America, the Caribbean, and, of course, the USA. Besides all that, there are the Boy Scouts and the Rotary. Finally, a new one to contemplate: "listening to my arteries harden." . . . Bill Ingle of Evansville, Ind., who retired as president of Corona Industrial Products in 1970, writes about his retirement activities: "I thoroughly enjoy sailing at our summer place in Wisconsin, wood-working at home, visiting our children in Chicago and Rancho Santa Fe in California, and reading scientific magazines."

Regretfully, we report the passing of two of our class members. Edwin T. Herbig, Jr., of Waterville, Minn., died last September, leaving his widow, Elaine Herbig, four children, and four grandchildren. His degree from MIT was in electrical engineering and, while here, he developed a new type of electroencephalogram for brain-wave recording. During his career, he held responsible positions in the Thomas A. Edison Laboratories, the Cardion Instrument Corp., the Gray Manufacturing Co., the Ray-O-Vac Co., and the E.F. Johnson Co. During the war, he served as a major in the U.S. Army Signal Corps. . . . James B. Ames of Norwell and Nantucket, Mass., died last October, leaving his wife of 47 years, Adele (Pitt) Ames. He was a retired chemist, receiving both undergraduate and graduate degrees from MIT. He last worked at the Cambridge Research Laboratory.

Our class extends its sincere sympathy to the Herbig and Ames families.—Robert H. Thorson, secretary, 66 Swan Rd., Winchester, MA 01890; Leonard A. Seder, assistant secretary, 1010 Waltham St., B-342, Lexington, MA 02173

opportunity also to attend the Alumni/ae Week Program. As the *Michelin Guide* would say, "worth traveling many miles out of your way!"

Ed Hadley's presence was especially noteworthy—he was recuperating from a knee replacement. Ed said, "The knee used to hurt when I stood on it. Now it hurts all the time!"

From the correspondence: Frank Gardner declared the trip with Eleanor to the Republic of Ireland was thoroughly enjoyable. They especially loved the west and southwest coastal areas, for their beautiful mountains sloping right into the Atlantic Ocean. As a plus, they had the opportunity to visit with Irish in-laws and friends. . . . John Glacken filed notice of a winter-time only address in Bradenton Beach, Florida! . . . Tony (Livingston) Smith was one of those commenting retrospectively on the success of our 55th and how much he and Dell enjoyed being with old friends.

We have several other deaths to note with sorrow. Irving Smith, Course X, on June 10, 1993. Irving was a long-term employee of Owens-Corning Fiberglass, "involved in widely varied and satisfying technical activities." He had been in California since graduation. That permitted many family activities: all forms of skiing, surfing, camping, along with Scouting and woodworking. He is survived by his wife, Joanna, son David, and daughter Diane.

Donald Macdonald, Course XV, a retired foreign service officer and professor emeritus of Korean Studies at Georgetown University's School of Foreign Service, died on August 29, 1993. Don spent 10 years in Korea as an Army officer, diplomat, and teacher, and was the author of two recent books about the country. His State Department assignments also included Istanbul and Geneva, plus a term as director, Office of Intelligence Coordination. Before coming to Georgetown University where he helped organize a Korean studies program, he had been a professor at East Stroudsburg University and Korea University in Seoul. He was associated with Senior International Resource Inc., a nonprofit organization he co-founded in 1990 to help government agencies and private firms in dealing with East Asia. He is survived by his wife, Jean, and son Thomson.

Peer Cody, Course X, died on September 20, 1993. After completing two years in the Navy, Peer joined Foster Wheeler Corp. From there he moved to Brown & Root, Inc., and eventually organized Peer J. Cody, Inc. He had reported, "I have been directly involved in the design and development of facilities for chemical and petroleum refining plants over a wide geographic range for most of my career. In the latter years I have advanced to project and senior management." Peer had been ill with cancer for eight years. He is survived by his wife, Nancy, sons Alan and Eric, and daughter Alison.

Edgar Taft, life science, died on October 4, 1993. Ed received an MD degree from Yale University School of Medicine. After serving as an Army laboratory officer in Panama during World War II, he finished his training at Boston City Hospital. Ed had research fellowships at the University of Kansas Medical Center and at the Karolinska Institute in Stockholm. He joined the Huntington Laboratory in 1950 and joined the department of pathology

# ClassNotes

at Massachusetts General Hospital. Two years later he was also appointed associate professor of pathology, Harvard Medical School. He was involved chiefly in research and teaching, and in 1966 he became research administrator for Massachusetts General Hospital. Ed was an accomplished pianist and after retirement often played for services at the Unitarian Universalist Church of Pittsfield. One of his relaxations was walking and maintaining the Appalachian Trail. He is survived by his wife, Priscilla.

Robert Park, Course X, died on June 23, 1993. Robert completed 43 years of service for Texaco, interrupted by 3 years during World War II to serve in the European theatre of operations in a special pipeline unit. Robert worked in the Port Arthur Refinery before the war, and returned to an assignment in the Natural Gas Division in Houston where he served as chief engineer, with supervision of design and construction of gas processing plants. He worked for many years in Washington, D.C., testifying as a witness for the gas industry before the Federal Power Commission regarding the regulation of the gas industry. Bob was an avid bridge player, musician, and one of the organizers of the hobby band, "And All That Jazz," that played for many charity events in Houston, and raised over 1 million dollars. He is survived by his wife, Dorothy, son Robert Jr., and daughter Marion.

With this issue, Gretchen (Van Stratum) Birge joins the authors as assistant secretary. Gretchen knows the ropes well, having been assistant secretary for 1963–73, and brings to us an outpost for our classmates on the West Coast. As Gretchen Inc., she has been involved in architectural design, principally industrial, and has contributed to the California miracle. Gretchen can attest to the appeal of the 1938 Mini-Reunions, since she has frequently made the transcontinental journey to attend!—Friederick J. Kolb, president, 211 Oakridge Dr., Rochester, NY 14617-2511, (716) 342-3093; Gretchen Birge, assistant secretary, 233 Carroll St., Apt. 202, Sunnyvale, CA 94086-6264, (408) 736-5011

# 38

I regret to report that we received word at press time that Horace Homer, your class secretary, died December 23 at Falmouth Hospital on Cape Cod. Details will follow in the next issue.

We had most of our Class' Executive Committee together for the Institute's Leadership Conference in October, to look ahead, and to consider what the Class expects of us! Ed Hadley, Fred Kolb, Paul O'Connell, Don Severance, Dave Wadleigh, and Al Wilson arranged a working lunch. Lou Bruneau provided a Treasurer's Report, showing that we about broke even on expenses for the 55th, and that we remain solvent. Don Severance reported that we have reservations at Endicott House for the 1994 Mini-Reunion, June 3–4. This has been a memorable tradition, combining the reunion with old friends, with the

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## 55th Reunion

Fred Grant, chairman for the 55th Reunion of the Class of 1939, received write-ins from

Manning Morrill's first formal bulletin, and committed reservations for 50 men and 45 ladies. The committee was enlarged to include volunteers Jim Barton, Burns Magruder, Fred Schaller, Sid Silber, and Doc Wingard. Those of the 95 who desire transportation from Cambridge to Newport, R.I., may assemble at McCormack Hall on campus before 2 p.m. on Tuesday, May 31, 1994, to board a bus provided by the Alumni/ae Association for the trip. Return by bus from Newport to Cambridge will be on Thursday, June 2.

Seymour Sheinkopf, class president, and Ernie Kaswell, class agent, report the 1939



# A Reluctant Hero

**W**ith seven of the crew severely wounded, no instruments, hydraulics and oxygen knocked out, and his body riddled with bullets and shrapnel, Jay Zeamer, '40, flew 500 miles back to base and crash-landed his B-17 without brakes or flaps. Successfully completing this photographic-mapping mission in the South Pacific on June 16, 1943, while fighting off 22 Japanese attack planes, won him the Congressional Medal of Honor. The mapping mission was critical to the successful American invasion of the Japanese-held Solomon Islands.

It has now been 50 years since the nation's highest award for heroism was presented to Zeamer, and the anniversary was cause for celebration of Jay Zeamer Day last June in Boothbay Harbor, Maine, where Zeamer now lives. The ceremony included military dignitaries as well as

family and friends. Governor John McKernan, Senator George Mitchell, former President George Bush, and U.S. Air Force Chief of Staff Merrill A. McPeak also participated and read letters.

"It was a hot rod," says Zeamer, referring to the junked bomber his crew found and outfitted for their mission. They replaced propellers and tires, added bigger engines, extra guns, and a toggle switch on the pilot's wheel that enabled Zeamer to fire in the area of the plane's blind spot.



Zeamer was so badly wounded that he was mistaken for dead upon landing back at the base. In fact, the Army sent his mother a telegram saying he had been killed in action that had to be corrected the following day. In addition to the Medal of Honor, Zeamer also received the Purple Heart, the Silver Star, the Distinguished Flying Cross, the Air Medal, and the Distinguished Unit Citation. Zeamer still says, modestly, that he didn't deserve any awards—he gives much credit to his crew, whom he claims deserved awards unique to each. □

—Sandra Knight



He needed all the extra help the plane could give him to evade and confront the unexpected enemy aircraft that appeared just 45 seconds from completing the mission. "I had to fly the hell out of the airplane," he remembers. "If you duck just before they start to fire, you can get out of their way, and they can't correct that fast." Over and over, Zeamer rolled hard, first to one side and then to the other, and opened up the throttle, eluding the swarm.

the Air Medal, and the Distinguished Unit Citation. Zeamer still says, modestly, that he didn't deserve any awards—he gives much credit to his crew, whom he claims deserved awards unique to each. □

*From upper right: Major Jay Zeamer at age 25; Captain Zeamer (back row, second from left) and his 1943 flight crew; the honoree on Jay Zeamer Day in June, 1993, Boothbay Harbor, Maine.*





Class Scholarship Fund made awards to seven seniors, juniors, and sophomores from E. Rutherford, N.J., Manchester, Mo., New York, N.Y., Queens, N.Y., Philadelphia, Pa., St. Louis, Mo., and El Paso, Tex.

1939ers are invited to review page MIT36 of the Nov/Dec *Technology Review*. Roger Crosley, MIT sports information director, mentions the many national honors earned by Lisa Arel, '92, finest woman gymnast; and Rod Trantum, '93, best wide receiver in football. Both earned National Recognition Scholarships, and Trantum's record at MIT includes a 5.0 grade point average in electrical engineering.

The Irving and Beatrice Peskoe Elementary School in Homestead, Fla., started operating in 1993. It costs \$8 million. Its capacity is 885 students and there will be an IBM computer in every classroom. Irv Peskoe died February 27, 1993, but every day hundreds of children see "PESKOE" over the door that Irv and Bea opened for them to better their lives. Bea expects to attend the Class 55th Reunion.

Brig. Gen. Leo Kiley and Luna reside in Santa Fe, N.M., and were pleased when Seymour Sheinkopf and Sylvia arrived in their silver bullet trailer to visit. Leo has had three careers in the Airforce, aerospace research, and manufacturing neutron devices. Leo and Luna expect to attend the 55th, subject of course to the green banana purple syndrome.

Bob Sternberg retired in Cincinnati after a full career with Procter and Gamble. In retirement these last 11 years, he travelled to all continents. Having just returned from two-plus weeks in Egypt he looks forward to the 55th, and hopes Ben Badenoch, Paul Stanton, Dick Cella, and Bob Stone will be there.

John Alexander and Nancy, and Bob Withington and Betsy are monitoring snowfalls and snowlines and they expect to complete a number of snow-ski outings before trying the water skis at Newport.

Bob Touzalin and Aletta missed seeing the Sheinkopfs during June in London, but made up for that by visiting them later in Burtonsville. Also, the Touzalins had visited Bob Schmucker and Jean in Amherst, N.H., and Fred Cooke and Eugenia in Canyon Lake, Calif.

Dick Christie and Barbara report from Excelsior, Minn., that, having achieved career summits with General Electric, they hobby now at model railroading, coin collecting, and wood working. They intend to be at the 55th.

Bill Pulver and Adie are swimming and snorkeling in the Caribbean. They expect to ski at Snowmass, Colo., and attend their son's wedding in San Diego before attending the MIT and Wellesley reunions in June.

Gus Griffin and Elizabeth attended the wedding of their son in England. Gus patented his process to recover chromium from industrial effluents. He built a mini-plant to produce marketable chrome chemicals.

Orlando DeAragon and Lillian are at home in Miami after an extended European vacation. Years ago he managed a sugar mill and rum distillery, and brought rum to a '39er reunion. Wonder what he'll bring to the 55th?

Charles Parker lives on Mason's Island, Conn., near to Newport, R.I., and he expects to attend the 55th. He invites classmates who may be interested in visiting Mystic Seaport and/or Mystic Aquarium just before or after reunion, to phone him at (203) 536-8510.

After their major round-USA trip, Seymour Sheinkopf and Sylvia presided over a family reunion for 125. Seymour collected data and edited and produced 75 copies of a 130-page family genealogy.

We are saddened by news of the deaths of two classmates: William C. Love, civil engineer, on June 28, 1992, at Nashville, Tenn. There were no details. . . . Richard K. Walker, mechanical engineer, died on September 19, 1993, at Convent Station, N.J. There were no details.—Hal Seykota, secretary, 2853 Claremont Dr., Tacoma, WA 98407

## 40

Al Guttag sent me a copy of his annual Christmas Card to Course V members. . . . A note from Barrett Taft tells of the death of his older brother, Edgar Breck Taft ('38), on October 4, 1993. Barrett also told of his family connections with MIT. Two other brothers were classes '44 and '48, and his father was in the class of '13! Please note that Barrett's city has changed from Maitland to Winter Park, FL 32789, although his street remains the same.

Jean L. Lewis, co-founder and chair of Lewcott Chemicals and Plastics Corp., passed away in Worcester, Mass., on August 22, 1993. Earlier in his career, he had been a research scientist for the army, developing protective clothing. Jean was past president of Beth Israel Synagogue, New England Region of Conservative Judaism; past chair of the Worcester Israel Bonds Drive; national VP of United Synagogues for Conservative Judaism; and a member of the board of overseers of the Jewish Theological Seminary.

In Caldwell, N.J., George W. Carnick passed away on August 28, 1993. George had been an Army captain during World War II and later became a CPA. He practiced for more than 30 years and also served on the board of directors of Carnick Laboratories, Inc., a Cedar Knolls pharmaceutical company for 50 years. He was a member of the American Institute of CPAs, the New Jersey Society of CPAs, and the American Chemical Society. . . . On August 14, 1993, John T. Muller died in East Falmouth, Mass. Prior to his retirement 18 years ago, John had been a resident engineer at the Woods Hole Oceanographic Institution. He was a member of the U.S. Power Squadron for 26 years and had recently been made a life member. He was a Mason in the West Indies and a charter member of the Falmouth BPOE Elks.

A recent letter from Class President Norm Klivans refers to the flood of replies to the recent questionnaire sent to class members regarding the 1995 55th Reunion. He says that a preliminary scan indicates that the bus is a good idea, reaction to the Class Fund is mixed, most of those attending would go to Woodstock, and that between 35 and 50 class members, plus spouses or friends, may attend. In addition, invitations will be sent to class widows, which will be handled by Sally (Mrs.) Bob Bittenbender.

Following are some of the survey responses forwarded to me with a note from class treasurer Dick Babish. . . . Raymond Keyes writes, "I am about to start wearing a left leg brace to relieve me of knee pain from a torn meniscus.

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I have been 63 years without one. If it works, it will be a welcome blessing. Otherwise, at three-quarters of a century of age, my health is good." . . . John A. Berges writes, "After a real fun job with G.E. as a general manager, have retired and am enjoying golf and travel. Have stayed in Midwest mostly because four of six children live in radius of 250 miles and come home periodically for free meals and golf."

"Things continue at a low and laid-back pace," writes Joseph P. Paine. "This year, besides our usual two weeks on the Maine coast in July and August, we leisurely drove around beautiful southern Utah/northern Arizona (canyon lands)." . . . Kenneth Lish says, "I finally really retired on March 1, 1993, at the third try. We have four grandchildren between here on Long Island and Boulder, Colo. I tutor children in a learning disabilities program attached to a community counseling center. I had an angioplasty on two vascular arteries and now follow a regular walking program four or five mornings a week. Advice to classmates—get a stress test. I'm trying to convince Norma to stop working so we can go where it's warm. I'm not doing very well at it."

Alvin Guttag is still in the running game. He writes, "In the Maryland Senior Olympics on October 7-9, in the 75-79 age group, I finished first in the 5k run, the 10k run, the 800-meter run, and the 1,500-meter race walk, and second in the 1,500-meter run. My time in the race walk bettered the record established in 1988 by five seconds. Also finished first in the 75 and over age group in the Army 10 miles. Still not a fast runner, but manage to do about 2,000 miles a year." . . . Thomas Goldfrank writes that after a career in building design, construction, and management, he has enjoyed 10 years of very good health with lots of tennis playing, oil painting, and other delightful retirement activities.

Dudley B. Follansbee "retired in 1977 to live on the water in Maine. Cruising all summer in our yawl; downhill skiing all winter at ski chalet in Bethel, Maine; travel in the spring. We take advantage of nearby Bowdoin College for courses, exhibits, and cultural events. One daughter with five children in nearby Brunswick; one in Newton, Mass.; one in Saratoga, Calif.; a son in Mystic, Conn.; and a total of 11 grandchildren. Life has been good to us with our bounty of gifts. Active in church, local community, several corporate boards, and MADD, and run a small business with my son." . . . Edgar L. Bernard is now doing volunteer work with the U.S. Air Force, Hanscom Field, at the Retirees Activities Office, and at the Transition Assistance Program.

From Denver, Robert M. Blunt writes, "Colorado is still the best place to live, in my opinion. Spent the last two years getting a course in high-energy engineering started at the Department of Engineering at the University of Denver, in cooperation with the Denver Research Institute. Try to preserve some of the know-how we learned by doing in the last 50 years—explosives, pyrotechnics, and propel-



lants. Rapidly dissipating as the 'old boys' retire. One son, at the age of 44, will have graduated from the Colorado School of Mines in December 1993, and another will graduate in chemical engineering in a couple of years—also then at 44! Just wonder why they waited so long. June and I are pretty healthy and have fond memories of Cambridge.”

George E. Niles writes from Idyllwild, Calif., of his pride in his MIT degree, rarely mentioning his other two degrees. He goes on to talk of both his and his wife's illnesses, from which they are both recovering. He further says, “Since I left Tech, I have moved many times, including a three-year stint in Europe building a chemical/radar accessories plant and electro-magnetic shielded and anechoic test chambers. My unique experience in Europe will make a book-length story! Few Americans, but all Europeans, understand said experience.” . . . And on a different note, Karl Pfister writes simply, “At our ages, no news is good news.”

Walter Helmreich called a few days ago to say he had some information concerning our class giving to the Alumni/ae Fund. Unfortunately, it has not yet arrived on this Christmas Eve, the deadline for the April issue of the *Review*. Hopefully, I can include it in the next issue. In the meantime, when I receive more responses to the questionnaire, I will cull excerpts to pass on to you.

And, of course, any further notes or calls of interest should be addressed to—Richard E. Gladstone, secretary, 250 Hammond Pond Parkway, 1205 S, Chestnut Hill, MA 02167, (617) 969-5161

# 41

Here I am at Christmas time writing up your contributions for the April issue. Although by that time my best wishes to you for a happy holiday season will be somewhat stale, I can hope you are four months into a very prosperous New Year!

The long publication lead times also prevent timely dissemination of sad news from classmates. In November Luke Hayden wrote: “My dear wife of 50 plus years, Dorothy Madeleine, died suddenly on October 31, 1993. She had an ardent love for MIT and every thing that spoke of Tech. Among her happiest experiences was coming back to the Institute for our class reunions. I thank all of our classmates who treated her so lovingly at our 50th, when she was wheelchair bound.” We all extend our condolences to Luke, and his four children and twelve grandchildren. I have vivid memories of a very pleasant visit with Dorothy in the colorful surroundings of President Vest's garden at the famous 50th.

A brief note from Oscar Alonso's wife (also Dorothy) informs us that he died in Miami, Fla., on August 28, 1993. There were no other details. Oscar, who was 74, was born in Havana, Cuba, and prepared for Tech at Chauncey Hall School. He majored in chemistry, was a member of the Chemical Society, and was active in swimming and a member of our Freshman Field Day Tug-of-War team. Our sympathy to Dorothy Alonso and their family.

Noting my lack of material for the January issue two classmates were inspired to contribute. Mal Abzug writes: “Professor Emeritus Gene Larrabee, '48, and I are collaborating on a book, *History of Airplane Stability and Control*. The book is turning out to be sort of an MIT project, with major help from Charlie Westbrook, '46, and an entire chapter on the discovery of inertial coupling by W. Hewitt Phillips, '40. The MIT professor who taught stability and control to us all, Otto C. Koppen, '24, is represented on the flyleaf by a quotation from a 1940 paper—“...any pilot can successfully fly anything that looks like an airplane.” We would welcome a loan of any material that should be included in this history, such as company reports on stability and control designs and problems. Call Abzug at (310) 454-6052 or Larrabee at (310) 493-1195.”

Reid Weedon writes on a Christmas card to him from Bob (Wallace) Blake: “John Sexton is living in the Aberjona Nursing Home, 184 Swanton St., Winchester, MA 01890. He is not well but does get out to go home to visit his family regularly. I'm still trying and succeeding in raising money for MIT. Have agreed to chair a special effort for the Independent Residence Development Fund, made necessary in part by the arrival on campus of sororities which need homes.” Bob Blake's note to Reid mentioned seeing Jim Mar at the AIAA meeting in Monterey this summer.

The Charles S. Butt, Jr. '41 Crew Shell was ordered in September as planned and mentioned in the '41 classnotes for October. This Vespoli Ultra-light D-hull is a very high-tech top-of-the-line racing boat and will be used by the men's lightweight varsity crew. There will be a brand new set of composite oars and a complete electronic system (cox-box) to accompany the boat. The current (December

'93) plan is to dedicate the boat at a ceremony after a major crew race this month (April '94). A “dedication row” by class members is also planned. Contributors to the fund should have the details in the follow-up to the August thank you letter from Coach Stu Schmill and Chet Hasert. Other interested classmates should call Coach Schmill (617) 253-1698 (office) or (617) 258-5773 (boathouse) for the final schedule. Sepp Dietzgen is trying to arrange a dinner for those in the area the evening of the ceremony. If you did not hear from him call Nancie Barber at the Alumni Office, (617) 253-8217.—Charles H. King, Jr., secretary, 7509 Sebago Rd., Bethesda, MD 20817, (301) 229-4459

# 42

Congratulations to Jerry Coe who continues as one of our class' top athletes by placing eighth in his age category skiing in the Budweiser NASTAR races at Snowmass, Colo. . . .

Jack Cantlin joined the 1942 representation on the MIT Council for the Arts. Our other members of the Council are Alan Katzenstein, Ellie and Harvey Kram and the Bob Greenes. . . . Toni and Mike Frueh divide their time between home in Storrs, Conn., a cottage in New Hampshire's White Mountains, and an annual three-week trip to England. That sounds busy enough! . . . Heine Shaw spent August and September in Kenya and Tanzania followed by two weeks with friends in Hartford, Long Island, Philadelphia, Gettysburg, and the Amish country. Already planning ski trips to Taos, Vale, Aspen, Mammouth, and Whistler.

An outstanding leader and a fine worker for our class, Charlie Speas, passed away in October. A Bronze Beaver recipient, Charlie served two terms as president of the MIT Club of Baltimore and as chairman of its Educational Council. We shall miss him. Sincere sympathy to Betty and to the family. . . . Two more obits this month: Harris Hanscom in Barrington, R.I., and Bob McAndrew of Pittsford, N.Y. They both graduated from Course II.—Ken Rosett, secretary, 2222 Americus Blvd. N., Clearwater, FL 34623

# 43

The news for this issue is somewhat grim—little news except obituaries.

William V. Engels (Course III), Great Neck, N.Y., died April 16, 1993. The notification from the Alumni/ae Association has no other information.

On November 11, George Feick III (Course X) passed away in Norwood (Mass.) Nursing Home of complications following a stroke. A native of Ohio, George joined Arthur D. Little Co. in Cambridge in 1950, retiring after 28 years of service. He then had a second career with J.B.F. Scientific Corp. of Billerica and Haemonetics Corp., retiring again in 1988. He was a Boy Scout leader and a member of the Congregational Church of Needham. To his wife, Jane, and to his four children we extend our condolences.

Whitney Newton II (Course V) of Franktown, Colo., died October 18. After serving in the Navy in World War II, Whitney had a career as a chemist with Great Western Sugar



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Co. and Holly Sugar Co. He was a member of AOPA, Red Angus Association, Denver Country Club, American Chemical Society, and Sugar Technologists. Our sympathies go out to his wife, Margaret, and to the other members of his family.

A clipping about Whitney Newton was sent by **Russ Coulson**, Englewood, Colo. After a wonderful time at the 50th Reunion, Russ had to undergo angioplasty, but reports that he is now fine. Last fall he and wife Helen enjoyed a guided van tour of Greece, with subsequent visits to Crete, Santorini, and London. It was fun, he says, but they're glad to be home.

**Gil Monet** has promised me a report for the next issue. I hope to outnumber the obits with items about the living.—**Bob Rorschach**, secretary, 2544 S. Norfolk, Tulsa, OK 74114

## 44 50th Reunion

By the time you read this, you should have received the registration material for the 50th Reunion. Complete it and send it back ASAP so we can firm up all arrangements. **Craig Williams** sends word from the West Coast that in June he will celebrate his 12th year in retirement. He manages to keep from being bored by indulging a dilettante's interest in art, theater, and music; in his spare time he enjoys the West Coast's outstanding whitewater kayaking and mountain biking to exercise the adrenal glands. His only serious regret is that his wife did not live to enjoy this life with him.

We regret to report the passing of the following classmates. **William A.H. Barton, Jr.** died July 14, 1990, in Gold Beach, Ore. He is survived by his wife, Joann, and a son. . . . **Carolus M. Cobb** died September 21, 1993, in Newton Highlands, Mass. He earned a bachelor's and doctorate's degree in physical chemistry from MIT and worked at Oak Ridge developing materials for the first atomic bomb. In 1959, he cofounded American Science and Engineering in Cambridge and served as chief chemist, VP, and on the board of directors. In the mid 1970s he began working on a method of detection of cervical cancer using radioactive gallium. He was in the process of seeking a patent for the results of his research just weeks before his passing. He leaves a son Carolus M. Cobb III of Athens, Ohio. . . . **Irwin M. Jennis** died September 30, 1993, in West Orange, N.J. He is survived by his wife, Sylvia, and daughters, Leslie, Wendy, and Abby.

**Jerauld O. Johnson** died December 24, 1988, in La Jolla, Calif., and is survived by his wife, Constance. . . . **Robert W. Jevon** died September 16, 1993, in Lincoln, Mass. While at MIT Bob was on the varsity track team, captained the lacrosse team, was a semi-finalist Golden Gloves boxer and a member of Chi Phi Beta Fraternity. In World War II Bob served as a flight instructor in the U.S. Army Air Corps. As an aeronautical engineer, he worked for Grumman, RCA, Bendix, Harbridge House, and Raytheon. Bob was a member of the Eastern Yacht Club, where he served on the race committee as fleet captain. He was an avid sailor who raced both one-design and cruising sailboats in Marblehead. He is survived by two sons, Robert of Lincoln and Thomas of Winchester. We extend the

sympathy of the class to the families of these classmates.

The recipients of the Class of 1944 Scholarship Fund for 1993-94 are: **Tony J. Baciagalupi**, '94, electrical engineering, Pine City, Minn., career: private industry and public education; **Jane M. Hammer**, '94, civil engineering, Cincinnati, Ohio, career: teaching young children about the environment; **Giang V. Lam**, '94, mechanical engineering, Chesapeake, Vir. (born in Hanoi, Vietnam), career: business; **Winnie Leung**, '94, mechanical engineering, San Francisco, career: engineering; **Adam T. Lindsay**, '94, brain and cognitive sciences, Dewitt, N.Y., career: academia; **Helen J. Park**, '94, biology, Brooklyn, N.Y. (born in Korea), career: medicine/biomedical research; **Magdalena Petryniak**, '94, electrical engineering, Ann Arbor, Mich. (born in Poland), career: graduate school; **Nicholas J. Ploch**, '94, electrical engineering, Windsor, N.Y., career: computer science; **Hoang H. Tran**, '94, electrical engineering, Houston, Tex. (born in Vietnam), career: research and teaching; **Susan A. Weakland**, '94, chemical engineering, Akron, Ohio, career: engineering; **Alexander B. Zakharov**, '96, electrical engineering, White Plains, N.Y. (born St. Petersburg, Russia), career: math and computer science/business.—Co-secretaries: **Andrew F. Corry**, P.O. Box 310, W. Hyannisport, MA 02672; **Louis R. Demarkles**, 77 Circuit Ave., Hyannis, MA 02601

## 45

By now you should all have heard from **Chris Boland**, class president, asking you to forward some class dues to **Jim Pickel**, class treasurer. Your 50th Reunion class book is an item that requires considerable "up front money," which in our case must be spread over a relatively small base, particularly when you consider that we are the smallest class since World War I. Please send Jim your 50 bucks!

**Emmett Day**, a retired professor of mechanical engineering at the University of Washington, reports that he participated in a 40-member Seattle Yacht Club exchange with the Royal Akarana Yacht Club of Auckland, New Zealand, last winter. Seattle in turn reciprocated last summer by having 50 Aucklanders join in sailing in the Canadian San Juan Islands.

**Marshall Byer** reports that he and Dorothy moved to southern California from Endicott, N.Y., in 1984 after retiring from IBM (an early out!). Two of their daughters together with one granddaughter and one grandson live in the area, and the third daughter lives in Kansas City. Marsh indicates that he has been busy battling the adjoining cities from takeovers and urbanization. More importantly he has gotten back into sailing at the USMC marina at Camp Pendleton, which is about 10 miles away.

**Curt Beck** of Pampa, Tex., not only continues serving many civic volunteer organizations but also provides environmental consultation to all who ask (or pay?). By the time you read these notes, the Becks will have six grandchildren.

If you possibly can, you should plan to be at the Institute on Technology Day as your many friends in the Class of 1944 will be attending their 50th Reunion.—**Clinton H. Springer**, secretary, P.O. Box 288, New Castle, NH 03854

# ClassNotes

## 46

I got a nice parcel of cards from MIT friends. The first card and letter was from my old roommate at the Graduate house. **Al Little**, whom I'd visited in Medea, Pa., and whose

fine wife, **Marian**, passed away last April, wrote about his visits with family in various places across the U.S. (Loda, Calif., San Antonio, Atlanta). One daughter moved back home (which was a great comfort). Al is working now at Martin Marietta. In addition, he belongs to "ScoreBeeper." We wish him the very best!

Another good friend, **Pauline Teague**, who lost her mother some months ago, sent me a nice card telling of her visits to Bermuda for a week or so. . . . **Don Burke**, a good friend in Florida, whom I wrote about some months ago, reports on his old roommate, **Dick Krahe**, who lives near him. Don says that Dick, due to a stroke, is less active and less able than he would like to be. Don suggests that '46 and '47 classmates write to him: Mr. and Mrs. Richard Krahe, Meadowridge E. #175, 2027 S.W. 15th St., Deerfield Beach, FL 33442.

**Stuart Edgerly** tells us that his boys live in "dear Colorado," one in the Aspen area and the other in Boulder. (I can't understand why Stu stays in Florida!) . . . Our friend from Central Park, **Ken Davis**, says he won't be back to Colorado in March to visit his daughter (near where I live), because she's moved to Cambridge. So they'll just have to shift to icier New England skiing. Ken's work is still quite successful. . . . **Elaine and Roger Bart** have put another one of their clever interesting limericks to keep us informed of their times in The Vineyard, cruises in the Atlantic, and play with grandchildren.

Another pair of travelers, living in the Pacific Pebble Beach, Calif., area are **Polly and Bob Zucker**, who are looking forward to our forthcoming 50th in 1996. They recently went to Sydney and then took a cruise around the South Pacific Islands. They also acquired another grandchild, now having one of each sex. . . . **John L. Bateman**, a New Yorker, continues a strong interest in the MIT admissions policy. He says minorities should have an equal chance at a high quality challenging educational experience. Right on, John!—**Jim Ray**, secretary, 2520 S. Ivanhoe Pl., Denver, CO 80222

## 47

We just got word that **Allyn Lumbert** died on July 4, 1993. He was living in Burlington, Mass., and is survived by his wife, **Esther**. Allyn started in the Class of 1941 but spent

over five years in the army in World War II so graduated with our class.

After graduation, he worked at Stone and Webster for a couple of years and then returned to MIT to work on a radiation project that was ultimately taken over by **Arthur D. Little** and **Allegheny Ludlum**. They formed Nuclear Metals, Inc. to continue the work and Allyn continued with that company until



1965. Then he joined Polaroid and remained there until his retirement in 1974.

No more news this month—our recent dry spell continues! Please, send news!—R.E. (Bob) McBride, secretary, 1511 E. Northcrest Dr., Highlands Ranch, CO 80126

# 48

Al Seville and his wife, Joan, are planning two weeks of skiing at Winter Park, Colo., where their daughter is a professional ski instructor. Their son is in graduate school at

MIT studying technology and policy.

Em Callahan has formed a business to introduce a unique voice/data integrated communication hardware package to the financial securities brokerage community. Using any of 200 buttons, a trader can make voice connections to trading partners or customers, or bring to any of six monitor screens data from news or quoting services. The product that Em and his associates have developed reduces the need for building wiring, does not depend on PBX or LAN connections, and provides for future changes to the action initiated when a button is pressed.

Like all new products, implementation of the concepts took longer than projected even though working prototypes of critical components had been demonstrated even before Em took the plunge and put his lifetime savings in the company in 1987. The business has totally dominated his life.

Em and his wife attended a Christmas party held by the MIT Club of Northern New Jer-

sey. Zelda and Jack Walch and Jeanette and Bob Ormiston also were at the party.

Our annual champagne brunch at Endicott House was attended by 39 classmates and spouses. Denny McNear, our class president, came from San Francisco, Peter Saint Germain drove up from N.Y.C., and Betsy and Bill Maley came from Connecticut. Also joining us, were Harry Lambe and Jim Christopher from the class of 1949.

At the brunch, George Clifford finished his job as nominating committee for our class officers. At our class meeting in June 1993, it was agreed to delay election of some officers until our new president had the opportunity to speak to some classmates who might be willing to serve as vice-presidents in addition to the slate that was proposed in June. George nominated Ken Brock, Dan Fink, Max Gellert, Bob Hanpeter, Harry Jones, Lou Kreek, Jack Page, Peter Saint Germain, Bob Sandman, Milt Slade, Bill Weisz, and Bill Zimmerman as vice-presidents of our class, and they were duly elected by our democratic procedures.

Bob Sandman officially transferred the class treasury to Harold Ottobri before the brunch. Included in the two cardboard boxes of records were two one-dollar bills dating from some point in the past.

Stan Abkowitz was awarded the 1993 ASM Eisenman Award. The Eisenman Award established in 1960 recognizes unusual achievements in industry based on the practical application of materials science and materials engineering in production or in engineering use. Stan was cited "for extraordinary achievements in the titanium powder metallurgy field

and for demonstrating a unique blend of engineering talent and entrepreneurial ability that has resulted in significant benefits to the aerospace industry." Stan is president and founder of Dynamet Technology, Inc. in Burlington, Mass. He is co-author of the book, *Titanium in Industry*. He has been granted 16 patents on titanium alloys and metal matrix composites.

Norb Andres and his wife, Pauline, spent their 42nd honeymoon at the Cloister, Sea Island, Ga. Norb has moved along in his most recent career as a personal financial planner affiliated with IDS Financial Services. He has passed the exams to qualify as a securities dealer and as an agent for health, accident, and life insurance. In addition, he recently completed a two-week course of intensive training at IDS headquarters.

Ed Kratochvil wrote to say he enjoyed our 45th Reunion and is looking forward to the 50th! . . . Fiorenzo Losco is still enjoying golden retirement years. He tries his luck at the nearby New Jersey casinos, plays golf, reads, and travels. He is contemplating a move south to a maintenance-free condo.

Jim Manson has become an avid rower. The high point of the year was the Head-of-the-Charles regatta. For the fourth year in a row (little joke there!), he has improved his relative finish in the over-60-years group. He was 11th of the 51 men. He figures he alternates in talking about business and about rowing (about 10:90 split). Jim's wife, Nancy, continues to sing barbershop quartet with her Sweet Adelines, Inc. chorus. They enjoy Florida where the rowing is better during the

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winter.

Just before he retired last year, **Barry Bloom** was recognized for making Pfizer Central Research a billion dollar, highly productive, multinational operation that has become one of the crown jewels of Pfizer and the pharmaceutical industry. The award stated, "Throughout his splendid career, Barry represented Pfizer R&D interests...in a multitude of forums, with style, precision of analysis, and a truly remarkable gift of articulation that earned the careful attention and respect of every audience." For nearly 20 of the 41 years he was at Pfizer, Barry headed Central Research.

**Gordon Johnson's** letter about **Carl Boll's** activities arrived too late to include with Carl's obituary which appeared in the last issue of these notes. Gordon wrote that after cancer prevented Carl from continuing squash, tennis, and skiing, Carl took up golf and played regularly. In addition, Carl saw all his children get married, including the youngest, Meg. Carl's mother, his wife's parents, his children, and grandchildren were all at the wedding to celebrate. Carl's mother, somewhere in her nineties, still lives alone in the house she and her husband built. Carl and his wife, Shirley, had been living in Rumson, N.J., for the past 30 years. On behalf of our classmates I extend our sympathy to Shirley, Carl's mother, and their family.

**Charles McDonnell, Jr.** died last year. He had been living in Purcellville, Mass. . . . **Dan Horan** also died last year. He had been living with his wife, Roberta, in Carmel, Ind. . . . **Edward Sevan** and **Frederick Vezina** died in recent years. . . . **Dick Von Kummer III** died in North Andover, Mass. On behalf of our classmates, I extend our sympathy to their families.—**Marty Billett**, secretary, 16 Greenwood Avenue, Barrington, RI 02806, (401) 245-8963

# 49

## 45th Reunion

**Bob Steinhart** writes: "I've just completed five years of retirement. Current activities

include EMT on Springfield (N.J.) First Aid Squad, mentor in IBM's Aristotle 2000 Program, and VP in New Jersey Region of the United Synagogue of Conservative Judaism." . . . From **Blair Manning**: "Still traveling. This year's big trip was to Ecuador's Galapagos Island (second time for us), where daughter Cindy works as naturalist/guide (in three languages). A unique wildlife site that everyone should visit at least once in their lifetime. Looking forward to Cambridge-Bermuda Reunion."

**Jan Peyrot** retired in 1987 after 35 years as a control engineer for Pratt & Whitney Aircraft working on gas turbine, fuel cell, and diesel engines. "Did attend Normandy reunion at Utah Beach in 1984 and 1989, but will forego the 1994 reunion there so as not to miss out on MIT 45th Reunion and wife Carolyn's 50th from Northfield." . . . On October 2, 1993, **Jack C. Tang** received the Bronze Beaver Award during the Alumni Leadership Conference. The Bronze Beaver is the highest honor the Alumni/ae Association can bestow upon any of its members.

**Ove Collett**, writing from Oslo, Norway,

sends the postage-saving message: "Retired. Healthy. Happy." . . . **Dr. Herbert Hershenson**, portfolio manager at Olson Mobeck & Associates in Rocky Hill, Conn., and director of Bridgeways Communications of Branford, Conn., has taken on a new responsibility—member of the board of finance of the Town of Woodbridge, Conn.

A heart-warming number of classmates are turning their business skills to the service of others. And because their backgrounds give them such powerful tools with which to work, their efforts are truly effective. One such is **Dave Hardin**, who received a Public Service Citation at the awards ceremony in Rockefeller Memorial Chapel at the University of Chicago on June 6, 1992. Excerpts from the citation include: "David Hardin has employed the skills he learned as a successful business leader to help people in desperate situations throughout the world. . . . After leaving his firm, Market Facts, more than a decade ago, Mr. Hardin became the volunteer president of the Chicago Sunday Evening Club, the longest continuously aired Christian television program in American television. . . . Mr. Hardin is currently president of the board of Opportunity International, an organization devoted to finding and implementing solutions for the problems of hunger and suffering through the creation of jobs and through incentives to stimulate small businesses in the Third World. Under Mr. Hardin's leadership, Opportunity International is reducing unemployment in many countries, having created 11,000 permanent jobs and improved the lives of 50,000 individuals in 1990 alone."

Another businessman-turned-benefactor is **Jim Veras**, part of whose moving letter reads: "This has been a landmark year of my life. Of greatest importance has been the passing of my precious mate of 44 years, Gary, following a 10-year odyssey with Alzheimer's disease, on August 13, 1993. Needless to say, the void and transition are devastating. Thank God I have my three extraordinary children (George, 43; Vivi, 41; and Lydia, 37) near me, as well as five grandsons, all of whom are my life and purpose. . . . Professionally, I've been executive VP of the World Environment Center for the past four years after beginning as a volunteer 10 years ago. I've helped build this wonderful organization from a staff of 5 to 80, with offices in New York; Washington, D.C.; Bangkok; Jakarta; Prague; and Mexico City. But I'm going halftime on January 1 to allow time for family and perhaps new activities. I'm hoping that I'll also find time to reenter my MIT alumni activities, which had to be interrupted to dedicate my full attention to Gary's needs. I need time to sort it all out and we'll see."

This April issue of *Technology Review* hits the stands just eight weeks away from our great 45th Cambridge-Bermuda Reunion. The Institute can be depended upon, as always, to provide a sparkling program in Cambridge, and your Reunion Committee, backed in a major way by the talent and hard work of **Stan Margolin**, will supply a second-to-none slate of activities on the island. According to questionnaires returned to the committee, most of you want: 1) a reception on Saturday night, 2) a boat cruise followed by dinner on Sunday night, 3) a sailing cruise on Monday, 4) dinner at a Bermuda home on

# ClassNotes

Monday night, and 5) a class dinner on Tuesday night.

According to a letter from **W.T. (Bill) van Ravenswaay ('44)**, **Ingram "Ike" Lee** died in an automobile accident in Texas on November 25, 1993. In his letter, Bill wrote: "He was a fine and distinguished man and will be sorely missed by his friends and family here, and, I am sure, by those of his classmates who knew him." I chatted with Ike on September 19, 1992, on the occasion of his receiving the George B. Morgan Class of 1920 Service Award for outstanding service to the Institute as an educational counselor from 1965 to 1993. Ike had a 43-year career with Texas Instruments and, at the time of our talk, was manager of Transportation for the United States operations of the company. "Just say I'm the chief truck driver," he remarked jokingly. Ike served his old Eagle Scout troop for more than a decade as assistant scout master. During that time, he had the satisfaction of seeing his son become an Eagle Scout in the same troop.—**Fletcher Eaton**, secretary, 42 Perry Dr., Needham, MA 02192, (617) 449-1614

# 50

This issue's reunion poll concerns the off-campus portion. Please send me a postcard or note saying if you prefer off-campus before or after the on-campus days, which run from

Thursday, June 15, through Saturday, June 17, 1994. Pencil in these dates on your calendar or in your powerbook.

Congratulations to **Hubert Barnes**, who writes that Penn State promoted him to Distinguished Professor of Geochemistry. . . .



**Mauricio Bazan**

**Mauri Bazan** has been elected to a Fellowship of the ASME. He co-founded the first mechanical engineering school in Venezuela at the Central University of Venezuela. Mauri has won prizes for his innovations in power technology and has authored many publications.

. . . **Bill Enders** writes that he and

**Jean** enjoyed some fun days at Tech in April followed by an intense tour of Iberia and Morocco.

**Jack McKenna's** wife, Dot, reports that he is making slow but steady progress in his recovery. We all wish them both well. . . . **Hank Quigley** is enjoying retirement from Du Pont by attending the Academy of Lifelong Learning. Hank sees **Art Fynsk** and other alumni there. . . . In October **Lindsay Russell** received the Bronze Beaver Award, given for distinguished service to the Institute. Lindsay also appeared on Channel 5 in Boston in November describing communications in civil defense organizations. He also described civil defense



procedures during World War II. Talking about TV exposure, Ed Perkins, editor of *Consumer Reports Travel Letter*, had a long interview on CNN telling people the smart way to travel over the holidays.

**Sam Rizk** has completed 20 years running his Crown Security Systems in Lynnfield, Mass. He recently had a joint anniversary celebration—his 34th and his daughter Lori's 2nd. His son Paul helps Sam with the business. . . . **Jim Staikos** has relocated from London to N. Palm Beach after retiring from 35 years of consulting for Arthur D. Little. He has remarried and is reviewing options for his next career.

There is some sad news to report. **Al Shaw** died May 29, 1993. A veteran of World War II, he worked for Loral Vought Systems in Arlington, Tex., from 1951 until the time of his death. . . . **Joseph Tilensis** died August 22, 1993, in Greenbelt, Md. . . . And finally this belated report. **Sherman Spaulding** died October 26, 1985. Sherman taught high school math in Sudbury, Mass.—**Robert A. Snedeker**, acting secretary, 7 Mashie Way, N. Reading, MA 01864-3423

## 51

The Class of '51 Fund for Excellence in Education was initiated at our 40th Reunion to enhance the undergraduate educational experience at MIT. Proposals for projects supporting this goal were solicited early in 1993. Four outstanding proposals, out of 18 submitted, have been chosen for funding by the Proposal Selection

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Committee. The selections were announced November 20, 1993 by Committee Chair Arthur Smith, dean of undergraduate education and student affairs. The awards totaled \$60,000, the amount available for disbursement from the fund at that time.

The Class of '51 Fund, established with significant support from the Grayce B. Kerr Fund, currently has a balance of \$365,000 and approximately \$340,000 of additional outstanding pledges. The fund, managed by the MIT Treasurer's Office, pays part of its annual earnings each year to the supported projects, with the balance reinvested so the principal will keep pace with inflation. Each spring, the dean for undergraduate education puts out a call for proposals for innovative projects that will enhance undergraduate teaching and education. The Proposal Selection Committee includes the deans for undergraduate education, science, engineering, humanities, management, and architecture.

This year's winning proposals included:

**The New 8.01:** Submitted by Professor Ernest Moniz, chair, Department of Physics, and Professor Wit Busza, chair of the committee to review the teachings of freshman physics. This is a proposal to make a major revision of the core 8.01 physics course that serves approximately 600 students—the first major change in this course in over 30 years.

**Program for undergraduate research in mathematics:** Submitted by Professor Sy D. Griedman, undergraduate chair, Department of Mathematics. The program will provide undergraduates opportunities for original research in mathematics similar to those provided by the UROP program in other departments.

**Virtual Technical Writing Cooperative:** Submitted by Edward Barrett, senior lecturer, Program in Writing and Humanistic Studies. The cooperative will give undergraduates computer access to specific information that can help improve their writing and communication skills.

**A method to improve undergraduate cognitive and abstract skills:** Submitted by Professor Robert Rose, director, Concourse Program. Professor Rose will develop a unique set of problems with the help of an experienced Russian educator that will provide an alternative way of helping students understand physics and applied mathematics.

At the Selection Committee meeting, Dean Smith commented that the Class of '51 Fund is a unique resource at MIT because it provides seed money on an annual basis for projects that can have a major impact on undergraduate education. He also noted that to his knowledge there is no other source of such funds at MIT, and that without these resources it is unlikely that many new programs would ever get started, particularly now, during a period of serious budget restrictions at the Institute. Members of our class attending this meeting included **Harold Glenzel**, class president; **Marvin Grossman** and **Bill Maini**, gift co-chairmen, and **Fred Ezekiel**, class agent. Please note: our class fund is permanently open for receipt of new money. Classmates should state their preference for the Class of '51 Fund for Excellence in Education when making gifts to the Alumni/ae Fund.

Now retired, **Walter Cook** writes that he is still enjoying sailing, flying, water skiing, and square dancing. . . . From Morocco, we hear

that **Edward Bronstien** is working for the International Executive Service Corps. . . . We received the sad news that **Kenneth Holmes** passed away in May 1993. He had retired as general business manager of Proctor Davis and Ray. Our condolences go to his wife, Rosamond.

On another sad note, **Thomas L. Thompson** passed away in August 1993. He came to MIT following service in the Navy during World War II. His career started with the California-Texas Oil Co. in New York prior to his moving to California. He worked for the County of Los Angeles as an air-pollution engineer and later with Aerojet General in the management and development of the Polaris Program. He became manager of manufacture engineering with Lockheed Propulsion Co. of Redlands, Calif. He retired as VP of Carlson Design & Construction Co. in Anaheim, Calif. We wish to express our sympathies to his wife, Marilyn, his son, Thomas, his daughter, Sharon, and their families.—**Martin N. Greenfield**, secretary, 25 Darrell Dr., Randolph, MA 02368

## 52

The Alumni Activities Office sent a letter to Class President **Bob Lurie** to tell us that this year's Class of '52 Scholarship Fund recipient is once again

ping-pong playing **Raul Rodriguez**, now a senior in the Department of Chemical Engineering. We are thanked for our contributions to the fund that make it possible for MIT to help students like Raul.

The letter was copied to **Richard F. Lacy** (sic), class secretary, and the copy mailed to **Richard Lacy**, '49. Since **Dick Lacy** and I live in the same city, and happen to see each other often, I received it in spite of the ingenious misdirection. I must point out to the Alumni Office that among our classmates are **Bill Dacey**, **Ed Dacey**, **Dick Lacey**, and **Mike Nacey**. **Lacy** is not a member of this class.

**Jim Davidson** moved last fall from Larchmont, N.Y., to Rose Valley, Pa. He says, "Rose Valley is heavily wooded, watered, semi-mountainous, close to Phila./Wilmington/Chadds Ford, I-95, and the Philadelphia airport, a 1,000-population municipality with some history of art and theater, and not too far from Marcelle's and my new golf club, Rolling Green." He wants us to know his new address is 23 Forest View, Rose Valley, Wallingford, PA 19086-6744.

**Charles Carter** retired recently after 34 years at the MITRE Corp. He and his wife are traveling, remodeling their home, and enjoying their leisure. They have four grown children, two of whom are still in grad school. . . . **Dick McCall** retired two years ago after 27 years at the Stanford Linear Accelerator Center. He is now a consultant on accelerator radiation safety. . . . **John Gaylord** is consulting for SEMATECH in Austin, Tex., after an enjoyable career at RCA and Siemens. . . . **John Fritts** writes that he is recovering from abdominal surgery performed last August. At the time of writing he hoped to be back to work by now. He says that he is now divorced, and that his son and three daughters are grown and gone and all doing well.—**Richard F. Lacey**, secretary, 2340 Cowper St., Palo Alto, CA 94301, e-mail: lacey@hpl.hp.com



Herein I will conclude summaries for attendees at our 40th Reunion. Marianne and Alan Lazarus were on hand for the Cambridge portion of the gala. Alan is still a teacher

and researcher at MIT, for the former a remedial course for freshman and for the latter in solar wind. They live in Lexington and their daughter is now a junior at Wesleyan U. . . . Another long-time teacher, Merrill Ebner, and his wife were on campus. Merrill is an engineering professor at Boston University and lives in Arlington. . . . Bob Rayfield made his first reunion appearance since graduation, trekking eastward from Princeton, Ill. As I saw it, he seemed to feel the venture was worthwhile. . . . Jack Stewart (who coordinated activities for us at the Cape) and his wife joined us at the Cape. Recently, he retired from the Cabot Corp. and they moved from Needham to Centerville (on the Cape).

Marv Turkanis and his wife were also in the happy throng, traveling northeasterly from Maryland where he is VP of Neutron Products, Inc. They live close by in Rockville. . . . Carl Wolf and his wife were there throughout, and, for blackmail or other good purposes, were catching many of us on film. They live in New York City where Carl is director of the Blood Bank and professor of clinical pathology at New York Hospital/Cornell Medical Center. (I think I will wait awhile before I use his services!) . . . Miriam and Jim Stoddard are in the Boston area, where Jim is a senior member of the technical staff at GTE Labs, Inc., while Miriam studiously continues her many art interests; they live in Weston. . . . In closing this recital of our 40th Reunion activities and attendees, let me note that many names were not included since the *Review* does not permit the inclusion of lists of attendees for whom there is no additional information. Drop me a brief bio if you unavoidably were excluded.

Janet (Zachs) and Mort Grosser, our most enduring "classmate" couple, have been in touch by phone and mail. They live in Menlo Park, Calif., and among their "comings and goings": Janet has been active with the San Francisco Ballet Auxiliary (of which she is immediate past president) and is on the International Ballet Council Board of Directors, serving as corresponding secretary; as such she writes and publishes four newsletters a year. She adds: "In May, Mort and I did our annual reverse technology transfer by chairing the MIT Club of Northern California goes to the San Francisco Ballet event. We took 40 Techies to La Fille Mal Gardee, and they loved it!" In June, Janet and Mort made their second trip to El Salvador where Mort serves as a member of the academic council of the newly founded Escuela Superior de Economia y Negocios, a four-year national college. Having learned how to turn business into pleasure, they will return again in January. (Janet's description of the ". . . beautiful lush jungle, exotic flowers, huge volcanoes, and gorgeous empty beaches" turned me green with envy.) Also, Mort's eighth book, *One Hundred Inventions That Shaped World History*, should be in print by now. Their son lives in southern California where he is VP of new media for Sony Pictures Entertainment.

Nich Fast reports that he has been "out" of the submarine business for over six years and, now that his wife has also retired, they really

enjoy life. They spent 106 days aboard their trawler last summer, "hanging out" from Long Island to Maine. He also gives about 50 days a year to Mystic Seaport Museum, "playing" in their shipyard. As Nick put it, "It's great fun to take a tree trunk, mill it into lumber, then build something useful." . . . A short note from Elihu Boldt reports that he was designated senior fellow at NASA's Goddard Space Flight Center in Greenbelt, Md. His field is X-ray astrophysics. . . . Richard Storey retired from Lockheed Advanced Development Co. in Burbank in February 1987 and relocated in Vista, Calif., shortly thereafter. Currently he is a registered health-insurance counselor and volunteer, while maintaining interests in travel, bridge, and cooking. . . . Dick Lockhart, now living in Greenfield, N.H., writes: "Still enjoying country life, including the ongoing work on our new/old house and the grounds. My wife and/or I are increasingly active at the state and regional levels in natural health care, affairs related to the developmentally disabled, and land-use planning and tax issues—challenging and engaging, but largely unpaid."

Christmas is now approaching, as well as present-wrapping chores, so I will sign off. Don't forget to send me a note, call, or drop by.—Martin Wohl, secretary, 4800 Randolph Dr., Annandale, VA 22003, (703) 354-1747

## 54 40th Reunion

Our 40th Reunion is almost upon us—you should have started your packing by now.

From the reception on June 1 at President and Mrs. Vest's home through relaxation at the Nantucket Inn on June 4 and 5, the festivities promise a great time for everybody. By now, you should have received not only all the details of the Reunion from Bob Warshawer, but you should also have been contacted by Ron Kurtz or one of the members of his Reunion Gift Committee. Please contribute as generously as possible if you haven't already done so—the Class of 1954 will not be outdone in supporting our alma mater.

As reunion time approaches, we are hearing from some members of the class who have been silent for a while. Dan Lickly writes from the coast of New Hampshire that he has "retired" but keeps busy teaching "Fortran for Engineers" at the University of New Hampshire and enjoying his seven-year-old son. In earlier times, Dan did engineering and computer work for MIT and for the NASA Apollo and Space Shuttle programs. . . . Art Coren reports that he and Judy have celebrated their 38th wedding anniversary and have two children and four "brilliant" grandchildren. (ALL grandchildren are brilliant, Art.) He has been president of Zenith Controls, Inc., in Chicago for 30 years. His company manufactures automatic transfer switches and parallel switch gear for emergency power applications. . . . From Bill Mayhew comes word that he has retired from Prince George's County (Maryland) Health Department, and is enjoying fishing and volunteer activities with the Civil Air Patrol.

Don McGrath reminds us again that, even though he retired from Allied-Signal Aerospace four years ago, he is still making

## ClassNotes

premium, prize-winning wines as the owner/winemaker of Villa Helena Winery in Napa Valley, Calif., and he welcomes any of us in the vicinity to stop by for a tour and a taste. He also does some part-time consulting in materials engineering. . . . Art Kaplan retired from General Electric last July and has formed a small company in Cleveland, Ohio, that provides services in the environmental, health, and safety fields.

In their annual holiday season update, Elaine and Roger Griffin report that they both still spend a lot of time in the pursuit of par on the golf course. Despite the time that takes, Rog also tends to business at Marine Hydraulic Systems, Inc., in Baltimore. The Griffins have five children and, as near as I can figure from their letter, three (brilliant, of course) grandchildren. . . . Catherine and George Schwenk's cat, Crathern (which now has its own letterhead), continues its ventures into reporting Schwenk news by letting us know that George is still buying and selling companies—the number remains fairly constant but the names on the list change. George also continues his work with the Boy Scouts while Catherine has become an expert on by-laws, hiring out to companies and organizations to put their operational guidelines in order. The Schwenks did their usual amount of traveling in 1993, and had the usual amount of intrusion on their lower New Hampshire property by various beasts and fauna. . . . The Eigns are also into the grandchildren thing. Granddaughter Kate arrived in October and helped her big brother A.J. celebrate his second birthday in December. . . . And I am sorry to report the death of Bill Holst in December 1992. We have no details, but extend our sincere sympathy to Bill's family.—Edwin G. Eigel, Jr., secretary, 33 Pepperbush Ln., Fairfield, CT 06430

## 55

Paul Mosher, Course X, retired from Kelco Division of Merck & Co. at the end of 1993. Paul put in over 31 years with the company, the last eight-plus as president.

Kelco is the world leader in alginates and biogums, uniquely functional water-soluble

colloids used principally in processed foods, textile printing, and oil/gas drilling operations. He reports that being part of Kelco and Merck has been absolutely superb and had the added bonus of allowing Wanda and Paul to wind up in San Diego, a great place to begin retirement!



Paul Mosher

Ralph Wanger,

Course XV, made the news as one of "The Top Five Fund Chiefs" as selected by *Worth*, an investment and personal financial planning



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magazine. Ralph has been the manager of the highly successful Acorn Fund from its inception in 1970, first for Harris Associates and then for Wanger Asset Management. He describes his funds strategy as "eclectic; just because you like lobster doesn't mean you won't eat steak." His style is reported to be research intensive—Acorn's portfolio is always full of companies that no one else has heard of and up to 25 percent of the portfolio can be in foreign stocks. His original Acorn Fund is now closed to new investors, but he has launched a new fund, Acorn International, in September 1992 with many of the same foreign stocks as Acorn Fund.

We are very sorry to have to report the deaths of two classmates. **George F. Harper**, Course II and a member of Beta Theta Pi, died on August 20, 1993. He had been living in Concord Greene, Concord, Mass. Unfortunately, no obituary information was available, but George was known, respected, and loved by many of us who saw him at class reunions and other functions. **David A. Brown**, Course III, died on June 27, 1991, having suffered massive strokes in 1989 from which he never recovered. David had worked as a metallurgist in Sweden and at the Stanford Research Institute. Later he was a teacher of mathematics and physics at the Mount Hermon School in Northfield, Mass., Rockland Country Day School in Congers, N.Y., and Rye Country Day School in Rye, N.Y. From 1977 to 1989 he taught at Santa Fe Preparatory School in New Mexico.—Co-secretaries: **Roy M. Salzmann**, 4715 Franklin St., Bethesda, MD 20814; **James H. Eacker**, 3619 Folly Quarter Rd., Ellicott City, MD 21042

# 56

E. Amazon reports from Geneva that he is busy in computer consulting. He is expecting to relocate next year to Recife, Brazil, to be near his daughter and her three children. . . . **Ward Halverson** is at Spire Corp., Bedford, Mass., where he is working on electroluminescent display research. . . . **Robert Santos** was ordained a deacon in the Catholic Church. He is retired from engineering with the exception of some minor consulting work. Santos' first grandchild, Jillian Annette, was born in November 1992.

**Chris Van Peski** moved to Austin, Tex., three years ago to work for SEMATECH. Currently, Chris is spending most of his time in Wilton, Conn., working with SUGL. . . . **Robert Vail** has recently joined Soep Associates of Boston. He will be responsible for project design and management for many of the firms corporate clients.

I am proud to report that my daughter **Laura** was married to **Ethan Brecher** on November 20, 1993, at the Copley Plaza Hotel in Boston. The happy couple will be living in New York City.—Please send news to **Ralph A. Kohl**, co-secretary, 54 Bound Brook Rd., Newton, MA 02161

# 57

**Bill Walsh** has left Virginia after only 14 months to move to London, where he is president of Mobil Europe. He writes that he left the Middle East and the Marine Group

behind him even though it had been a fun job. The economic conditions in Europe are apparently a challenge to the petroleum industry as much as to everyone else, so we wish him luck. . . . **Larry Young** continues his saga in the space program. He was an alternate for the October flight of the *Columbia*, and supervised some of the experiments on that mission.

**Stanley Kroder** received, in 1993, a PhD in management from the University of Texas at Dallas. He now teaches telecommunications management at that school after retiring from IBM in 1988 following 29 years of service. . . . **Gorken Melikian**, of Somers, Mass., died on October 11. He had been with United Technologies since 1957, and was at the time of his death the manager of Environmental Systems and Technology at the UT Research Center.—**John Christian**, secretary, 23 Fredana Rd., Waban, MA 02168

# 58

During my heavy travel schedule in November and December, the mailbag accumulated a number of items and I scooped up even more news while on the road. In Mexico

City I visited with **Ray Danon**, who has entered the consulting business with an emphasis on helping North American companies do business in Mexico. His firm, Danon and Associates, already has several diverse projects under way, ranging from the start-up of a cogeneration venture to the development of Mexican market entry strategies for U.S. and Canadian manufacturers. In fact, as a result of our conversations at the reunion, Ray and I are working together on a project in Mexico. While there, Nancy and I enjoyed a wonderful dinner party at Ray and Loretta's charmingly restored home in the historic San Angel district of the city. (Obviously, the moral is to always attend '58 class reunions).

Our latest retiree is **Bill Cooper**, who enthuses, "I took advantage of the University of California's early retirement incentive program in November. So far, so good! Our sons Bill and John graduated from Harvard in June, then topped it off by going to the Henley Regatta and winning the Britannia Challenge Cup in the men's coxless fours, setting a course record in the progress." . . . We were pleased to learn that **Dick Barone** has been working at SYBASE as a contract professional employee—which seems to be a growing trend in the U.S. today. Dick notes, "While I had not previously considered this approach, my first assignment came within a week of registering. On the family front, my son Rich has just about finished his associate degree. Paul has graduated from Providence College, and Tim is now at PC as a freshman."

Readers of the *Wall Street Journal* may have noticed that **Leonard Simon** now holds the office of chair, president, and CEO of the Rochester Community Savings Bank. . . . Also in the *Journal*, **Glenn Strehle**, in addition to his duties as MIT's treasurer, has been named a trustee of the Property Capital Trust in Boston. . . . The American Booksellers Association has named **Willard Dickerson** as education director. Previously he was executive director of the Logos Bookstores Association. He has also served as a faculty member of the ABA's bookselling schools in Singapore, Malaysia, the U.S., and several Eastern Euro-



pean countries.

Stan Klein sent along an upbeat memo saying, "Glad to report that I'm back in the swing after a lengthy bout with what the doctors called a 'non-specific gastro-intestinal virus.' I'm back to running, but not yet to my usual five miles a day. Also, I've rediscovered the joy of sailing Tech dinghies on the Charles River, something I did while at MIT. Recently I received a first-place award for interpretive/analytical writing from the Newsletter Publisher's Journalism Association. And, I'm teaching an adult education course called Writing for Career Advancement that I hope will turn into a book."

At Penn State, Toby Carlson continues to demonstrate the complementary nature of science and music. He says with bemusement, "Last year, Simple Gifts, a three-person instrumental folk music group to which I belong, recorded its first CD. Called *Down by the Sally Gardens*, it's selling well locally and was reviewed favorably in one national folk music magazine. Being a local celebrity and musician in frequent demand is a new experience—one that is as much fun as my job. Oh, yes, that's still professor of meteorology at Penn State." (Hmmm...don't give up the day job yet, Toby!) ... With that, we'll just sign off for this month.—Mike Brose, secretary, 75 Swarthmore St., Hamden, CT 06517, (203) 288-3822

## 59

### 35th Reunion

Kudos this month to Kent Kresa, CEO and President of the Northrop Corp. for his appointment to the board of Atlantic Richfield in Los Angeles, and to Nam P. Suh, Eloise F. Cross Professor of Manufacturing at MIT, who received the William T. Ennor Manufacturing Technology Award of the American Society of Mechanical Engineers. Nam Suh holds a master's from MIT and in 1964 earned a PhD at Carnegie-Mellon, and is an ASME Fellow and has chaired its Productivity Committee.

A note from Howard Markham from his home of 26 years, Reston, Va., reports that he and Pat Ruggiero were married in 1987 and spend much of their leisure time at English and Scottish country dancing and have even started a local group nearby in Herndon. Howard also plays English concertina and piano for local English and New England contra dances. He comments: "Our generation lives in wondrous times. Country dance and music, gardening, and hiking have been for Pat and me sources of simple, lasting pleasures in the midst of the frenetic, ever-accelerating change that is closing out our millennium. Much of our culture seems banal and short-sighted. But, walking in the halls of the Institute this summer, I thought of the thousands and tens of thousands who have worked and studied there seeking the truths of nature, taking the long view. Our motley fellows and forebears have produced much that is beautiful as well as the banal. It is all quite bewildering and exhilarating." Our thanks to Howard for sharing these significant thoughts!

Also, Stephen Lorch became chairman of the board of Vinfen Corp., one of the leading providers of human services in Massachusetts.

He has worked on the management level for a number of health care and human services firms and as a consultant, and after leaving MIT studied at Harvard's School of Public Health and Medical School. Vinfen offers a variety of services to persons with disabilities, and emphasizes empowering disabled individuals to live at the highest possible levels of independence; his goal in the changing health care world is to find new and innovative ways to provide and fund services for the long-term disabled. Stephen, his wife Jane, and three children live in Brookline, Mass. Congratulations to all.

Alan Donaldson's report notes that instead of retiring he "made the mistake of inventing a process for producing nanocrystalline metal and ceramics," now the basis of a start-up company which will keep him fully occupied for the next few years.

On the Reunion front, plans continue to solidify at a good pace and the 35th Class Gift effort is by now, I am sure, in full swing (these notes are written several months before they appear creating, at times, a rather curious time-warp phenomena). So if your plans to come to the 35th are not totally solid, make sure they become so pronto! Many of your classmates look forward to reconnecting with you in early June.

That's all for now. Again, I urge you to actually do it—to send an update which will be much appreciated by your classmates.—Dave Packer, president, 31 The Great Road, Bedford, MA 01730, (617)-275-4056

## 60

I recently received a call from Tom Christy, who told me that he had retired from his job with the Navy's Surface Warfare Center in Silver Spring, Md. Tom said that he was still working at his same desk, part-time, as an employee of Atlantic Research Corp. He and his wife had just returned from a nine-week trip that included seven weeks in Australia and two in New Zealand. Tom is still playing ice hockey with his seniors' team (and, I presume, still seeking interested fellow players). ... Sheila Widnall, now our secretary of the Air Force, is one of 10 persons nominated by *Design News* for Engineer of the Year honors. The award will be voted by the magazine's readers and announced about the time you are reading this column. Part of the award is a \$20,000 scholarship to a school of the winner's choice.

Word has it that Beryl Denker, who heads her own Allston, Mass., firm, ABR Associates, has been named to the board of directors of the Institute of Management Accountants. Congratulations, Beryl! ... From Monterrey, Mexico, Juan Llaguno-Farias writes that he continues as Korn-Ferry International's man-on-the-spot in northern Mexico. Juan has been with Korn-Ferry, the international search firm, for 16 years and expects business to get stronger with the advent of NAFTA. Juan says all of his seven children—ages 19 to 29—are still at home, but that 1994 maybe will see some of them getting married (and, I presume, leaving the nest).

Finally, I sadly report the death of James C. Madden, IV. Jim died on August 19, 1993, at his home in Houston after a long battle with brain cancer. He had been active in communi-

# ClassNotes

ty affairs in Houston, and prior to that had been executive VP of Lizza Construction Co. in Oyster Bay, N.Y. Jim is survived by his wife, Linda, and two sons. Our deepest sympathy goes out to Jim's family.—Frank A. Tapparo, secretary and class agent, 15 S. Montague St., Arlington, VA 22204

## 61

Oh ecstasy, oh rapture! Raw material for the notes has arrived by air, sea, and wire. Several messages came over the e-mail in the last few weeks and I am very appreciative. The first

was from Dave Roberts from the Cleveland Freenet (al736@po.cwru.edu) who wrote: "I enjoy reading about the accomplishments of my classmates, but echo Ed Berger's sentiment (Nov/Dec '93) that there are few names I recognize. Come on Virgil Vickers, Tony Joy, Jerry Weingart, Bob Treister, Hugh Willis, and other old pals, let's hear something from you! I do occasionally run across Malvin Teich (professor at Columbia University) at laser photonics conferences and even bought his recently published *Fundamentals of Photonics*, a real gem (Wiley-Inter Science, 1991, co-written with B. A. E. Saleh).

"I think the convenience of your e-mail option will help elicit more responses (it did from me). Perhaps one reason you do not hear from more classmates is that much of your mail is from those who boast rather formidable achievements and/or cosmopolitan life styles, thus intimidating many of the rest of us mere mortals into anonymity. Suppressing that instinct, I thought it perhaps noteworthy that the small company (Cleveland Crystals, Inc.) that two other principals and I founded 20 years ago is still alive and well, despite our government's best attempts to squelch private enterprise in this country. I have been responsible for most of our linear, nonlinear and electro-optic single-crystal devices for scientific, medical, and inertial confinement fusion lasers. Recently, I was privileged to receive the Optical Society of America's "Engineering Excellence Award" for hardware and software developments in these areas.

"Although I gave up the oboe many years ago, my violinist wife, Edith, is still concertmaster of the Cleveland Philharmonic Orchestra (Cleveland's 50-year-old-plus civic orchestra, not THE Cleveland Orchestra). With each passing Cleveland winter, we look forward to an eventual move to Arizona, where I grew up and Edith also has friends and relatives. But first, we have to put our son Daniel (age 18) through 5–6 years of college. He is a first-year pharmacy student at Ohio Northern University and is also active in computer telecommunications and music."

A second Internet message came from Maynard Johnson (MaynardJ@aol.com) who was moved to type: "I'm still in the patent department at Marion Merrell Dow in Cincinnati, senior staff counsel. I'm spending about 20 percent of my time traveling, which is why I am using a Mac Powerbook.



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"Both children are out of the house. Rachel is married and living in Anchorage, Alaska, working at the Federal Express Pacific terminal and dodging bears when hiking on weekends. Anders is at the Kansas City Art Institute doing things with digital photo and video imaging. On my off time, when I have some, Sara and I are playing music—hammer dulcimer and citterns and guitar for historical reenactment events, Scottish Highland games, and occasional theater incidental music. I couldn't resist the temptation of Midi, and our house is almost littered with synthesizers. If you have access to a Mac and a synth, try downloading the Bach Tocatta & Fugue in D minor in the AOL MMS Midi library.

"I'm sorry that I missed the class reunion in '91, but it coincided with daughter Rachel's graduation. I'm looking forward to the '96 reunion."

A press release from the Federal Reserve Bank of Boston arrived a few weeks ago with the word that Jerry Grossman is now chair of the Boston Federal Reserve (Warren Rudman, who neglected to go to MIT, is vice-chair). Jerry runs the local Federal Reserve when he finds time away from the New England Medical Center, where he is CEO.

Joe Harrington wrote that reorganization had hit New England Electric and he decided to look around for other things he'd rather do. He found something. "I'll be starting, January 1st, as an assistant dean in the School of Engineering at a well-known technical institute in Cambridge, Mass." He will be starting a second career in resource development (or, in English, fund-raising). It turns out that each of the five schools at MIT has a development officer. Joe will hit up the business/corporate community. On a more personal level Joe writes that "I spent a week in Idaho in July, most of it floating the middle fork of the Salmon River. A great experience for the most part. In late August/early September I went to Hungary for a week on a consulting mission for New England Electric's international subsidiary. And by way of a 30th wedding anniversary celebration, Diethild and I went to Bermuda for five days over Thanksgiving. Scuba diving on a coral reef the afternoon of Turkey Day was a new experience for this New Englander, but we liked it enough to say 'We'll be back!' as the plane lifted to bring us home. Both our boys are good bets to finish grad school in the first half of 1994. Rob is completing a master's in biomedical engineering at WPI, while Joe, our planetary astronomer, is closing in on his doctorate as he winds up his 10th year at MIT. They still don't give those degrees away for free! Diethild continues as a visiting assistant professor of German at WPI."

Some short notes arrived in the mail the other day. Joe Verderber said he ran in the Twin Cities Marathon (in Minneapolis) with his youngest son, Paul, finishing in 4:15. It was Joe's first marathon. Actually Joe says he didn't run with Paul, he just started with him. John Ritter wrote that "Barbara and I are still enjoying life in Western Massachusetts. I continue to be quite active in sports—tennis and squash with biking and skiing thrown in. Luckily my research (polymer adhesion) continues to attract support. With our youngest now in college Barbara has gone back to school full-time in psychology."

Finally, I think I ought to write about my

own activities. After a year of unemployment and consulting I decided I had to get back into the real workplace. So I took a job with Harvard as the head of Biological Safety. It sounded cushy and it paid well. It hasn't turned out to be so easy. I am responsible for keeping researchers at Harvard and the seven huge affiliated hospitals from killing themselves and infecting the outside world. I spend a lot of time running around. It's time to trade in my 10-year-old Honda! I was able to get away for my annual week in the Grand Canyon. Every year I wonder why I keep going to the same place and every year when I get there I remember why I go. After a lifetime of travel, with visits to four continents, I still haven't found any place that compares to the Canyon.

Keep writing! Your classmates are actually interested!—Andrew Braun, secretary, 464 Heath Street, Chestnut Hill, Massachusetts 02167, or via Internet: andrewb820@aol.com or abraun@husc4.harvard.edu

# 62

John E. Prussing has been elected a Fellow of the American Institute of Aeronautics and Astronautics (AIAA). He was cited "for contributions to astrodynamics research and

education and for service to the aerospace community." Annual election of Fellows of AIAA is limited to one per thousand members. John will be honored at a black-tie dinner in Arlington, Va., in May 1994.

Steven J. Brams writes that he is still a professor of politics at NYU. His book, *Theory of Moves*, was published by Cambridge University Press in both paperback and hardcover in January 1994. While based on the classical theory of games, it proposes major changes in rules to render it a truly dynamic theory. This theory is applied to a series of cases drawn from politics, economics, sociology, fiction, and the Bible.

Ellen Koerber writes that after 15 years of practicing internal medicine, the exponential increase in hassles coupled with the exponential decline in compensation have prompted her to leave medical practice and pursue a career change. She expects to be employed full-time as an interior designer by 1996. This demonstrates, once again, the incredible diversity of career options opened by an undergraduate education at MIT.

Darold W. Rorabacher has announced that, "He is a Grandfather!" His daughter, Anna, gave birth to Zoe Louise Szok on June 23, 1993. While it is an exceptional experience to become a grandfather, perhaps we could give some credit to Darold's son-in-law as well! . . . Robert E. Anderson has resigned from his position as chair of GenRad, Inc. according to an announcement in the *Boston Globe* on October 2, 1993.

Dan L. Smythe, Jr. sent me copies of two articles concerning classmate Bill Koch from the December 15, 1993, issue of the *Boston Globe*. The first announced that Bill may be about to become \$46 million richer due to being improperly denied a \$20 million abatement (now plus interest) on taxes he paid on a 1983 stock transaction. It seems that the Massachusetts Revenue Department has been trying to collect capital gains taxes on stock in a Delaware-based corporation that they claimed Bill was using to avoid paying taxes in Mas-



sachusetts. Now I understand why Bill moved to Florida. The second article dealt with the recent management shake-up at Kendall Square Research Corporation, in which Bill has a 29 percent (controlling) stock ownership. Bill was quoted as saying, "I need this (the management hassle) like I need a hole in the head, but I want to see this company survive, and grow, and prosper." We wish him luck in refocusing the company's sales and engineering efforts on commercial, rather than scientific, prospects. KSR computers emulate the speed and functions of a supercomputer with machines that utilize hundreds of microprocessors working in parallel—a design that is significantly less expensive than the machines made by producers such as Cray Research.

In our continuing investigation into humor in the classroom, **Irv Thomae** sent me an e-mail message reporting that his son, Randy, now a graduate student in Course II at MIT, has observed at least one professor that is not only funny, but whose students actually laugh at his jokes! Irv is not completely convinced that this is any more than casual empiricism from a small sample, but wanted to supply one more observation. You might recall that this research started with an observation that students at the University of Michigan seemed to continue to take notes without laughing at jokes made by their professor. I have added the observation that my students tend to be reserved in their laughter for the first few attempts at humor, and then warm to my efforts as they get along in the course—perhaps under the (false) impression that laughing at the professor's jokes might give them some advantage when exams or papers are being graded. Then, when anonymous course evaluations are given, they become exceptionally critical of the attempts at humor by the professor (especially if they disagree with the humor in politico-economic commentary). Perhaps others of our academic colleagues might lend their observations to this on-going examination of humor (or the lack of a sense of humor) in the classroom.

Please write when you can to: **Hank McCarl**, secretary, P. O. Box 352, Birmingham, AL 35201-0352; e-mail: uabnhnm01@asncube.asc.edu

## 63

Happy New Year! This four-month delay is some time warp, isn't it? **Maury Lanman**, VI, is now director of engineering for AMX in Dallas. They make advanced

remote-control devices for multimedia centers. He is in new product development and finds it exciting. . . . **Carl B. Dover**, VIII, was appointed adjunct professor of physics at State University of New York at Stony Brook. He was elected vice-chair of the Division of Nuclear Physics of the American Physical Society for 1993-4. He will be its head the following term. . . . **Robert Bolus**, VI, is a physical scientist at CRREL in Hanover, N.H., working for the U.S. Army Corps of Engineers. Daughter Shelly is a geology major at Wittenburg University and in her junior year. Wittenburg has a great reputation for its area in the Midwest. . . . **Alan Kamin**, who we last saw in economics, is a superior court judge for the State of Arizona. . . . **Thomas P. Gerrity, Jr.**, VI, is

in the news again, this time joining the board of directors for Reliance Group Holdings, Inc. He continues as a dean of the Wharton School. . . . Finally, **Robert P. Porter**, VI, writes that he is now professor of electrical engineering and chair, Ocean Acoustics and Electromagnetics (Applied Physics Lab) at the University of Washington. His wife, Charlotte Lin, was a lecturer in the Math Department in 1977. They would like to see our class out there enjoying the Pacific Northwest with them.

Keep the alum news coming! Try to get it to Tech or me by the first of the month. You can reach me by snail mail: **Shoel M. Cohen**, Dept. of Psychology, Nassau Community College, Garden City, NY 11530 or e-mail: Internet 71271.2627@compuserve.com or Compuserve 71271,2627. You can also call me at home at (516) 489-6465. It would be great to talk to you personally.

## 64 30th Reunion

Just about two months till our reunion; the plans sound quite interesting with lots of opportunities for low-decibel socializing. Please contact the Alumni/ae Association or get in touch with reunion co-chairs **Bill O'Halloran** (617-245-9090) and **Bruce Strauss** (617-734-9425) for info.

Lots of news items this time around. From a recent issue of *Harvard Magazine* comes the information that **Bob Scott** will be stepping down from his position as Harvard University's VP for finance to take on new challenges in a variety of different areas. Bob joined Harvard in 1976 as director of the Office for Information Technology after serving in several administrative positions at MIT. A number of colleagues at Harvard praised the importance of Bob's role in creating a state of stability amid a volatile environment in higher education.

Also in Cambridge, **Pat Gage** was appointed COO of Genetics Institute, Inc. He had previously served as senior VP for scientific affairs, and executive VP since joining Genetics Institute in 1989. In his new role, Pat will be



**Patrick Gage**

responsible for the daily operations of the company, a \$100 million per year biopharmaceutical developer. . . . Another transition to report is that of **Michael Hirsch**, who was named VP for external affairs for Geotek Industries in Fanwood, N.J. The change will involve a relocation from his previous position with CTIA in Washington, D.C. . . . Prolific class author **John Shelton Reed** recently published *Surveying the South: Studies in Regional Sociology*, a collection of some of his essays about the American South. John is William Rand Kenan, Jr., Professor of Sociology, adjunct professor of American studies, and director of the Institute for Research in Social Science at the University of North Carolina in

# ClassNotes

Chapel Hill. . . . **Sanford Hellman** reports that he is currently VP for steam generator services at the B&W Nuclear Service Co. He is living in Lynchburg, Va.

From the Alumni/ae Association we get the news that **Frank Marcoline** of Utica, N.Y., has been selected as this year's recipient of the Class of 1964 Student Financial Aid Fund scholarship. He is a junior majoring in physics with electrical engineering and is maintaining an outstanding academic record. He hopes to continue on for a PhD and do physics research. Frank volunteers at the Cambridge Rindge and Latin School, is on the MIT varsity sailing team, and plays jazz saxophone. The Association and the Institute greatly appreciate our collective generosity and wish us luck as we try to pass the \$100,000 mark for the Fund as part of our reunion activities.

Speaking of which, don't forget—Tech Night at the Pops, Technology Day, interesting seminars and chances to renew acquaintances while enjoying tasty food. Furthermore, a chance to elect new class officers; I'm still looking for a volunteer to take on the fourth 10-year stint as class secretary. See you soon!—**Joe Kasper**, secretary, RR 2, Box 4, Norwich, VT 05055

## 65

Please send news for this column to: **George McKinney**, secretary 33 Old Orchard Rd. Chestnut Hill, MA 02167 phone (617) 890-5771,

fax (617) 890-3489

## 66

I have written about many of our class who have sent their children to MIT. This time we have a third generation MIT student. **Peter E. Lobban** writes that his son, Andrew, is

now a freshman at MIT. Peter's father was Class of '39. Peter has just completed his first year at a biotech startup company called Affymetrix. They apply photolithography from the semiconductor industry to the creation of large arrays of DNA probes on a solid substrate. The probes can be used to detect complementary sequences in any desired nucleic-acid pool. They are pursuing applications in the diagnosis of genetic diseases and the detection of exogenous DNA in an organism. . . . **Donald DeAngelis** is a senior research scientist in the Environmental Sciences Division at the Department of Energy's Oak Ridge Lab. He has been appointed to the Evaluation Committee for Research in Aquatic Ecology for the Swedish Natural Science Research Council. He is recognized nationally and internationally for his research and publications covering population, community, and ecosystem theory and modeling. . . . **Jim Kester** is no longer working for an MIT-founded company as the part of the company he works for has been bought up by a larger software firm. Jim was key to a big contract win this year and expects to keep his job with the new firm. He



had one of his conference papers printed in an IEEE journal, his first national exposure. His wife, Esther, is still teaching, enjoying some real successes this year but some "real rotten kids" too.

Lots of job changes for the new year. **Denis Nagy**, who was COO for MacNeal-Schwendler Corp., has been promoted to senior VP for operations. . . . **P. Jeffrey Trimmer** moved from general product manager at Jeep/Dodge Truck to general manager of business strategy for international operations at Chrysler Corp. . . . **Carl Jones III**, "after being out of work (again!)" is now at the Stanford University Hospital Information Services Group as manager of application services, reporting to the CEO. His son Matthew is a senior in high school, and daughter Karen is a freshman.

After 20 years, **Paul Liao** has moved out of the research area at Bellcore to become general manager of Network Foundations, Architecture and Planning Center, there. . . . A bigger



**David Vanderscoff**

job change may be in the works for **David Vanderscoff**. David has announced his candidacy for the U.S. Senate. He currently runs his own employee benefits consulting and administration company in Bismarck, N. Dak. He strongly supports small business and the private enterprise system. He has already pledged

to resign if he ever votes for a tax increase and has put that resignation in writing. He even has his own 800 number, 1-800-VOTE-DAVE.

I didn't think we could top Dave's news this month, but my husband has provided me with a clipping from the *Buffalo News* about **George Smoot**. George's studies have provided much evidence in support of the Big Bang theory of creation of the universe. He now says that if matter in the first second after the Big Bang had expanded just a hundred thousand trillionth slower than it did, the world would not be here today. I can't explain the whole article in this space, but you can read his new book, *Wrinkles in Time*, for details.—**Eleanore Klepser**, secretary, 84 Northledge Dr., Snyder NY 14226-4056, email: vismit66@ubvms.cc.buffalo.edu

# 67

The news has been lighter than usual lately. Please write. . . . **Greg Wight** has been promoted to professor at Norwich University. At about the same time, the Environmental

Engineering Department, which Greg chaired, was eliminated, and he joined the Civil Engineering Department. Greg is currently on a leave of absence, spending the academic year as a visiting professor at the Air Force Academy, where he is helping them to get their undergraduate environmental engineering program ready for first ABET review in 1996. Greg and his family love Colorado, especially the mountains, which is quite a change for people who have lived most of their lives on

the East Coast. . . . **Richard Vaughan** proudly announces the birth of his third child, Elizabeth Celia, on October 25, 1993. Elizabeth's sister Catherine is 7 and brother William is 3. Richard doesn't yet know which of them will attend MIT. . . . **Larry Galpin's** first year as VP of Daikin America has been eventful. They are in the process of starting a fluoropolymers plant in Decatur, Ala., and Larry reports that this experience with a Japanese company has been interesting, frustrating, and overall gratifying. He is looking forward to the next period.

**Bob Domnitz** has been appointed Telecommunications Industry Specialist within Massachusetts Governor Weld's Executive Office of Economic Affairs. The Weld Administration has targeted telecommunications as a strategic industry for the Commonwealth. Bob's job is to provide individualized assistance to telecom firms and to advise the Administration on policy matters that are vital to the growth of the industry. He recently received a law degree from Boston College Law School. . . . **Roy Gamse** left MCI last May to start a new environmental group for kids called Earth Force. His children, Nicky (10) and Laura (9), are very excited about this. . . . **Stephen Metz** was recently named chief, Division of Gynecology, at Baystate Medical Center. He's not sure this is an even trade-off, however, because of the mountain of paper that has appeared on his desk.—**Charlotte and Jim Swanson**, co-secretaries, 878 Hoffman Terrace, Los Altos, CA 94024

# 68

Did you miss your chance to buy a genuine Class of '68 25th Reunion T-Shirt last

year? **Roger Fox** produced an outstanding design with 25 gold images of a '68 Brass Rat's top surface arranged in a 5x5 array. Roger has donated the profits to the class treasury (which needs it) and has kindly offered to do another production run. So if you'd like this special souvenir of MIT, just send \$15 per shirt to us (address at end of column, payable to MIT Class of '68) and indicate size and two choices for background color (we think maroon looks great—other reasonable colors also available).

**Dan Harris** proudly reports that he has two sons at MIT and is not asking for donations because his book, *Quantitative Chemical Analysis*, is now the leading undergraduate analytical chemistry text and is in its fourth edition. His son David is a senior in Courses VI and XVIII and also plans to get a Course VI SM in June. Doug is a freshman thinking about Courses V and VIII. . . . A newspaper clipping reports that **Russell Bjork** is a member of the Beverly (Mass.) School Committee and chair of its finance committee. He is also professor of computer science at Gordon College. In addition to two degrees in Course VI, he has a master's of divinity from Gordon-Conwell Theological Seminary.

**Bill Carlson** has been promoted to VP and

chief technology officer of Intermetrics, Inc., in "our fair city" of Cambridge. . . . Similarly, **Ben Roach** has been promoted to VP of strategy, planning, and special projects at Savannah Foods and Industries, Savannah, Ga. . . . **Marilyn** and **David Banach** live in Trumbull, Conn., with their children, David, 14, and Jaclyn, 10. After graduation he received an MSEE and JD degrees from the University of Connecticut and now works as manager of procurement/subcontracts for United Technologies.

**Francis (PhD, '71) and Fredda Hoffman** Cole stayed closer to the 'Tute in Stowe, Mass. Fredda is president of Castlerock Corp., which specializes in funds transfer and banking systems. . . . Even closer to Cambridge are **Roxanne** and **Randall Warniers** and their children **Evan**, 6, and **Brett**, 3, in Arlington. However, he didn't always stay so close to the fold—he moved to Los Angeles after graduation and

**'68's 25th Reunion T-shirt logo**

stayed in California for 17 years, picked up an SM in physics from UCLA, an MA in English from Berkeley, lived the Bohemian life in the '70s, and got hooked on professional photography and then electronic publishing. He's now technical editor of the



**Lincoln Laboratory Journal.**

After positions at MIT and the University of Rochester, **Michael Riordan** moved to California, where he is assistant to the director at the Stanford Linear Accelerator Center. He has written or co-authored three books: *The*

*Solar Home Book*, *The Hunting of the Quark*, and *The Shadows of Creation*. . . . That's all we have for this month. We're looking forward to hearing from you.—**Gail and Mike Marcus**, secretaries, 8026 Cypress Grove Lane, Cabin John, MD 20818

# 69

## 25th Reunion

The reunion spirit must be in the air—lots of notes this time. Fifth reminder: Our 25th class reunion is fast approaching, June 2–5.

It is with sadness that we note the death of **Thomas M. Dooley**. Tom was a project manager at the U.S. Department of Transportation's Vople National Transportation Systems Center in Cambridge, where he had worked since 1976. Most recently he was project manager of the change management division, where he consulted with federal agencies on ways to improve their performance by using



information technology. Last October, Tom died of cancer in his home in Arlington, Mass. Tom leaves his wife, Anne, two sons, Brook and Carl, and his mother, Martha Dooley of Beaufort, S.C. Tom was a 1971 graduate of the Sloan School of Management and was also an Army veteran. A former Somerville resident, he had served on the board of directors of the Somerville Community Corp. for 13 years and had been its president before moving to Arlington in 1992.

**Charles R. Cornell** of Naperville, Ill., is serving as 1993-94 chairman of the Society of Automotive Engineers, Inc., Chicago Section, the third largest section in the world. He is now vice-president of engineering for DAI Technologies in Lisle, Ill. . . . **Donald Rosenfield** is a senior lecturer at Sloan School and directs the Fellows Program in the Leaders for Manufacturing Program. He lives in Lexington with his wife, Nancy (Liebman), '71, who runs the R&D group at Hart-Hanks Data Technologies. They live with sons Todd, 15, and Adam, 7. Their daughter Jennifer, 19, is MIT '96.

**Steven Maser** is on sabbatical leave for 1993-94 from Atkinson Graduate School of Management at Willamette University in Salem, Ore. He spent the fall semester at home, finishing a research project and writing. Now he is spending the spring semester at the Olin School of Business at Washington University in St. Louis as a visiting research professor. It was "time for a change of scenery," Steve writes. . . . **W. David Lee** is still at Arthur D. Little, where he is a senior VP and managing director of the technology and product development business. He and wife, Ramsey, live with their two "wonderful" daughters.

**Michael A. Neschleba** writes: "I have just completed riding shotgun from Acton, Mass., to Palo Alto, Calif., in my son's first car. It was quite a trip, and I highly recommend it for anyone to do once. There's lots of neat stuff between the two coasts!" . . . **Stephen Schiffman** received tenure last year, and is now an associate professor of information systems at Babson College. His wife, Lisa, continues to work as a reference librarian at MIT's Barker Engineering Library. Their daughter Emma is now a sophomore at Harvard. . . . **Michael Sporer** and his wife, Suki, live in Wellesley with their two children Hannah (7) and Matthew (4). Mike has been at Data General as Corporate Technologist for the past year and a half. "Hello to all my classmates and the AEPi old guard," he writes.

**John Schmitz** writes, "I've been getting more involved with children's activities—advising the youth group at our church and helping a first grade teacher at the local elementary school. I highly recommend it. Still programming and managing programmers as well." . . . Listen up Hillary and Bill! **Michael E. Solin** writes: "Closed private medical practice after 17 successful years of family practice in Leesburg, Va. Joined the U.S. Air Force as a lieutenant colonel and have moved with wife, Enid, to Albuquerque, N.M., where I practice at the Kirtland AFB Hospital. This was my carefully thought out response to the country's ongoing health care catastrophe."

We read in the spring 1993 issue of the Washington University Law School Magazine about the travels of **John Drobak**: "In June 1990, Drobak and his colleague Douglass C.

North, Luce Professor of Law and Liberty, spent three weeks team-teaching an intensive course entitled Institutional Framework of Competitive Markets to the first class of the U.S. Business School in Prague. They covered the law and economics of how to make a market system work, including such areas as property rights, economic regulation, and antitrust law." John, whose own grandparents came from Slovakia, said, "It is an exciting time over there and I thought it would be fun to be part of that." He planned to return for another teaching stint.

As these notes are entered on my Mac in late December, I have just returned from Maui, where I attended the spectacular Fourth International Conference on Cold Fusion (ICCF4), sponsored by EPRI. Classmates **Dean Musgrave** and **Joe Veranth** were also there, so you might say we had a mini-reunion in Hawaii. ICCF5 will be held in Nice, France, and ICCF6 in Beijing. Some venues, eh, for a "dead issue"?

I am now the editor for a new national and international magazine, *Cold Fusion*, which will be launched in spring 1994 by publisher Wayne Green, Inc., of Peterborough, N.H. Some of you might know that Wayne Green launched *Byte* magazine and many other computer publications, which helped to accelerate the personal computer revolution. Wayne believes that *Cold Fusion* will have a much greater impact on the world than *Byte*, and so do I.

See you all at the reunion!—**Eugene F. Mallove**, secretary, 171 Woodhill-Hooksett Rd., Bow, NH 03304

**70** **Tom Hafer** has been living in Arlington, Va., for 14 years with his wife, Ann, and two children, William (14) and Virginia (12). Tom has been working at ARPA trying to figure out whether it is still a defense agency, and Ann is in the midst of a partial career change from consultant to volunteer Latin teacher. . . . **Joe Baron** is starting a new company, Gardener's Helpro, in Huntington Beach, Calif. It will do research and development and manufacture home gardening tools and related products to make gardening easier and more fun.

**Howie Bluestein**, who lives in Norman, Okla., spent last year exploring tornadoes and water spouts. In August, he flew in a NOAA helicopter filming water spouts in the Florida Keys for *National Geographic*. Before that, he tested a portable 3mm pulsed doppler radar for use in probing tornadoes. . . . **Wesley Moore** says that he has had a change of face, having shaved off the mustache that he grew between semesters in 1968. . . . **John Huchra** challenges us to print his news: "Got elected to the National Academy this year, and married for the first time last year to another teacher, Rebecca Henderson, '81."

**Jim Hecht** writes from Davidson, N.C., that he is living on Lake Norman and sailing regularly, although his three daughters prefer to ski. A VP at Ingersoll-Rand, he is responsible for its air compressor after-market business. . . . **Duane Shinnick** tells us he is representing homeowner associations in construction defect lawsuits and insurance bad faith claims in San Diego. He also ran into **Mike Venturino**, who is a pilot for United Airlines.

# ClassNotes

**Alan Stiehl** is still at TASC in Reading, Mass. . . . **Marc Tipermas** is executive VP and director of Corporate Development for ICF Kaiser International, Inc., an engineering, construction, and consulting services company based in Fairfax, Va. In October 1993, he was elected to its board of directors. As director of Corporate Development, he focuses on marketing and sales, technology development and acquisitions, and product development.—**Greg and Karen Arenson**, secretaries, 125 W. 76th St., Apt. 2A, New York, NY 10023

**71** **Dubose Montgomery** and his partners have raised \$175 million for a new limited partnership for Menlow Ventures. . . . **Michael Kearns** writes: "I continue to marvel at my good luck in sharing my life with the world's two most beautiful daughters, Monica, 10, and Shannon, 7; as well as the world's best cat, A.K. Growltiger (lineal descendant of the original immortalized in T.S. Eliot's 'Growltiger's Last Stand') . . . eating poetry can be a way of life." . . . **Donald Horrin** is now professor of economics and associate dean of the College of Social and Behavioral Sciences at Ohio State University.

**Al Solish** writes: "I still practice in five offices in Los Angeles County specializing in glaucoma. I'm more than a little worried about the administration's desire to eliminate specialists from the health care system. I am trying to acquire a Swiss optical company. Our three kids are doing well. We'd like to hear from old AEP friends or anyone else we've lost track of. Al can be found at 1425 El Vago St., La Canada, CA 91011." . . . **Peter Lindner** is working with American Express Bank at the New York City office in the Global Systems Group. . . . **Michael Gilmore** recently changed jobs, joining the civil litigation unit of the Idaho Attorney General's Office. . . . **Gus Vlahakes** is happily settled in Boston with his wife, Kathy, and 5-year-old twins, Alexander and John. He would enjoy hearing from other friends from our class.

**Jerry Croan's** firm Caliber Associates is celebrating its 10th anniversary marking 10 years of continuous growth providing applied social science research and consulting on social policy and program issues. . . . **David Spear** is working at Pratt & Whitney watching staffing levels plummet. . . . **David Wineberg** has just completed his fourth year as chief of Housing and Household Economics Statistics Division of the Census Bureau. His 15 minutes of fame come each year when he holds a press conference releasing the nation's official income and poverty statistics. . . . **Charles A. Eby, III** recently moved from Boston back to native Maryland. He is working as a VP of information services for the Investment Company Institute which is the mutual fund industry's trade association in Washington. He and his wife, Cindy, have two children, Charles (8) and Christopher (6).

**Nancy Liebman Rosenfield** and her husband, Don, '69, live in Lexington. Nancy is the



product development manager of Hartehanks Data Technologies. Don is senior lecturer at MIT. Jennifer, 19, is a sophomore at MIT. Todd is 15 and in the ninth grade and Adam is 7 and in the 2nd grade. . . . **Barnie C. Black** lives in the Washington area; he is married and has two sons ages 5 and 3. He is senior principal engineer at Integrated Systems Analysts, a consulting engineering firm. . . . **Dale R. Geiger** is director of the Government Management Institute. He lives in an avocado grove in Valley Center, Calif. After receiving bachelor's and master's degrees in metallurgy from MIT, Dale received a master's degree in management science from the Sloan School. He spent two years at Corning Glass Works and fifteen years at Texas Instruments. In 1968 he accepted a doctoral fellowship at the Harvard Business School and he is now teaching management and governmental accounting at Cal State, San Marcos, which is the first new public university in this country in over 25 years. His research agenda is focused at the current and potential uses of management accounting and control systems in government. He has testified to the Federal Accounting Standards Advisory Board and has consulted for the Internal Revenue Service on their efforts to develop a cost management accounting systems. He has served the National Academy of Public Administration as a panel member and researcher. . . . **Dave Fish**, a Delt, is alive and well in Houston and is a heart surgeon and, apparently, a very prominent one, in the Houston area.—**R. Hal Moorman**, secretary, P.O. Box 1808, Brenham, TX 77834-1808

# 72

From Caracas, Venezuela, **Lorenzo Lara-Carraro** writes that he is doing research and teaching math in business issues at IESA, a very prominent business school in Caracas.

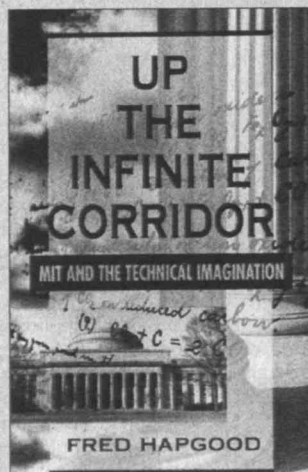
He keeps in touch with MIT through the systems dynamics group at Sloan. . . . **Martin Bilsker** has been a cardiologist on the faculty of the University of Miami School of Medicine for the past 11 years, and he is director of the echocardiography laboratory at Jackson Memorial Hospital. His wife, Beverly, is an attorney. They have two children, Miriam (10) and Daniel (5). They enjoy Miami but, over a year after Hurricane Andrew, are still recovering and completing home repairs due to salt water storm surge flooding and various other damages to their home.

**Deborah Bovarnick Mastin** is halfway through her one-year tenure as chair of the Florida Bar Entertainment Art and Sports Law Section, working by day as an assistant court attorney for Dade County, Fla. She works with construction law and art law issues. Her two sons, Seth (10) and Jonathan (6), bring new joy each day, and she ends up volunteering a lot at school. . . . **Michael Kotch** is still plugging away at Unisys. With mergers, acquisitions, and name changes, he has now worked at 10 companies without changing jobs. He is designing a comm link for the brilliant eyes satellite and a fiber-optic CATV system for the Navy. He is also working on an instrument rating for his pilot's license. He has 12 horses on the ranch now, 3 cats, and a rabbit.

**Dan Geer** was described in the *Cambridge Chronicle* as a "computer executive and community activist." Outside the office he heads Cambridge Citizens for Liveable Neighborhoods. At the office he heads the Security Business Unit of Open Vision Technologies, a California company to whom he and his partner recently sold their computer security consulting practice. His area specializes in network and communications security software products. . . . As of November 1, 1993, **Larry Lasky** became director of Transfusion Medicine at the Department of Pathology at Ohio State University in Columbus. His wife, Susan Fuhrman, '75, is going back into private pathology practice at Riverside Hospital in Columbus. . . . **Kenneth Wang** received the Henry B. Kane '24 Award at the Alumni/ae Leadership Conference on October 2, 1993. It is given in recognition of exceptional service and accomplishments in fund-raising for MIT.

**Ronald W. Lyster** directs the Trusts and Estates Work Group at the law firm of Gipson Hoffman and Pancione in Los Angeles. He is a licensed real estate broker as well as being a certified tax specialist in California. He has been very active in the Westwood Village Rotary Club on the Youth, Community, and the International Service Committees as well as serving as the secretary, and currently its VP. He is a member of Beta Gamma Sigma, a business administration honor society. . . . **Daniel Lynch** now holds an endowed professorship at the Thayer School of Engineering at Dartmouth. He is an executive director of the

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Regional Association for Research on the Gulf of Maine. He is also part of a group of scientists who study the Georges Bank ecosystem. In his future research he may explore global management of industrialization.

As I write this, I am looking forward to Christmas and New Year's here in Florida (and hope you all had a great one), but by the time you read this it will be time to wish you a Happy Easter! Send in more news!—Wendy Elaine Erb, co-secretary, 6001 Pelican Bay Blvd., Apt. 1001, Naples, FL 33963

## 73

Esteemed classmate David Reed has left Lotus Development after more than seven years to join Interval Research Corp., a Palo Alto-based collection of about 50

researchers working on proofs of concept for computing technology. Between the joy of pursuing his new dreams and the joy of life with Jessica, Colin, Katie, and Carly (class years unavailable at press time), looks like the 40s will be his best decade yet. . . . John Breen notes that he has stepped down from his position as Cubmaster in Southboro, Mass., after six years, moving on to BSA Troop 92, where he is Scoutmaster. He reports with relief that these roles are supported by wife Wendy and sons Chris ('01), Todd ('05), and daughter Lisa ('11).

Dan Morris would like former Senior House residents with whom he hiked over 20 years ago to know he has finally finished hiking all the New Hampshire 4,000-footers, finishing with Carter Dome last October. Anyone else done? . . . Ken Finder writes of marrying Midge in 1987 and becoming parents in 1990. Son Ian is fascinated by machines and delights in taking things apart. Ken has been at Tera-dyne forever, and is currently "pretending to be" director of engineering for the Telecom Division, near Chicago. . . . Richard Weissberg has left his job at Lotus to join two other (unrelated) Sloan graduates, Barry and Patty Jacobson, in a small consulting company, doing business reengineering. So far, he reports, it's "great fun."

The Reverend Greg Chisholm has been named to the Board of Trustees of Fairfield (Conn.) University. Greg's MIT background will no doubt be of help as the university incorporates computerization in its long-term campus plans. . . . Willy Shih was mentioned in a *Wall Street Journal* article on recent senior-level departures from IBM. He had been the director of IBM's personal advanced workstations business.

Write!—Robert M.O. Sutton, Sr., secretary, "Chapel Hill," 1302 Churchill Ct., Marshall, VA 22115

## 74

### 20th Reunion

Fellows and followers, you are reading my next-to-last *Class Notes* Column. The June issue

will be my last effort after 15 years as Your Faithful Scribe. No hard feelings, just a persistent, small voice saying I should be turning my attention to other things. Over the course of the past year I have terminated all my other volunteer activities. Class Secretary of the

Class of 1974 is just the last item on the list to go. There is an opportunity here for another to take the position. With Dave Withee writing every other column, this task has transmogrified from a persistent duty into a pleasant pastime and creative outlet. Surely there is another within the sight of my prose willing to strut their epistolary stuff on these pages. The pay is lousy but the hours are your own and, as I've said before, you get to see your name in the pages of an international magazine eight times a year. Those attending the 20-year Reunion will vote for a new Class Secretary, but frankly, anybody who wants it can have a shot at it. Maybe that's you?

Robert Dutton has become vice-president and general manager of strategic communications at GTE Government Systems Corporation. Robert and his wife, Jean, have three children, Kelly, Bobby, and Chris, and live in Bedford, Mass. . . . Just thought you'd like to know that the recipients of the Class of 1974 Scholarship awards are seniors Andrew Lan and Eleni Kapogiannis. Both are doing very well academically. . . . Deborah Jackson checks in with this from the wilds of West Los Angeles, Calif.: "After poking around in Southern California for the past 13 years, I am now on staff at the Jet Propulsion Laboratory. Which means that besides resisting wildfires, floods, and riding out earthquakes, I get to have a hand in the development of actual hardware that goes up on deep space satellites." She closes with an invitation to old buddies to look her up at JPL. . . . Ed Ringel has been elected to the level of Fellowship at the American College of Physicians. He lives in Waterville, Me.

"After five years at ARPA running the display program," writes Marko Slusarczyk, "I am now VP of a company that develops technology from the former Soviet Union." . . . William Ladd is living a busy career. He's chair of the Radiology Department at San Antonio Regional Hospital; a clinical assistant professor of radiology at the University of Texas at San Antonio Health Science Center; a radiology consultant at the Research Division of the Cancer Therapy and Research Center; and an MIT Educational Counselor.

Remember the reunion is only two months away. Don't write (me, that is!). Send news to Co-secretary Dave Withee, 1202 Linden Dr., Mt. Pleasant, IA 52641—Lionel Goulet, co-secretary, 115 Albemarle Road, Waltham, MA 02154-8133

## 75

Please send news for this column to:

Jennifer Gordon, secretary  
c/o Pennie & Edmonds,  
1155 Avenue of the Americas,  
New York, NY 10036; or  
18 Montgomery Place, Brooklyn, NY 11215

## 76

Hurrah! We have news. However, this does *not* mean that those who have not sent word in a while can simply sit back and relax. We continue to need everyone's cooperation—

send news!

From George Todd: "I'm still working hard in the oil fields of Texas, engineering and installing waterfloods. I found time to upgrade

# ClassNotes

my pilot's license this year to multiengine, instrument-rated. Now I can fly to exotic places like Beaumont and Abilene, Tex. . . . I won't have to worry about the oil business. In a couple of years, Clinton and Gore have made it clear that they would like to shut down the oil business in the USA and rely on the wackos in the Middle East for our oil supplies. I may just quit fighting them and go windsurfing instead. . . . I ran into Paul Erb and his wife, Barbara Belt, '77, in Corpus Christi some time ago. They were attempting to teach me the planing jibe on a sailboard without much success."

Martin Fuchs writes, "After 15 years with the Waters Chromatography Division of Millipore, I recently accepted a position as director of instrument development at Perspective Biosystems. I am enjoying the small company environment even though the change from a Fortune 500 to a start-up meant a major adjustment in mode of operation. The family has grown to four, including daughters aged 6 months and 4 years." . . . Robert Struth is "now a commander in the Navy. I continue to fly F-14 Tomcats. In January 1993, I became the commanding officer of the Naval Air Systems Command Detachment Norfolk. We are responsible for program management, logistics, and engineering for out-of-production aircraft such as the F-14A, EA-6, and A-6E. In addition to flying a Tomcat, I own a Cessna Cardinal lightplane and an ultralight. Widowed in 1988, I have since remarried and have two sons."

Debby Stein Sharpe writes: "My life is full of kids, work, Temple, and fun. We just finished a summer of [weeks off] four days at the beach, three days at work. My boys (Nathaniel, 5, and Jacob, 3) look like little lifeguards. The aluminum extrusion business is picking up after a long recession. I juggle—um, keep—the books and assure environmental compliance, to keep my husband, Jim, out of jail (on both fronts)." . . . A laconic missive from Michael Ryan: "Working in eastern Ohio for Costain Coal, Inc. District deputy in the Knights of Columbus. Enjoy running marathons."

From Lee Silberman: "Two years ago we moved to rural Long Island, N.Y. No, that is not an oxymoron—my next-door neighbor owns horses and we live on a private road. Alan Fisher, '73, lives nearby. Our sons ride on the same school bus and we have joined a local Temple together. In June we attended the Bat Mitzvah of the eldest daughter of Richard Barron, '74, in Washington. We saw Howie Finkelstein, '74, and Chris Domain, '74, and Joyce Lerner Domain, '75, none of whom I had seen in about 15 years. We spent the weekend celebrating and reminiscing. My wife, Lucy (Smith '72), is on the faculty at SUNY Stony Brook Medical School. I am now export sales manager and part owner of Puralee Fabrics Ltd. We were recently listed as being the 25th largest home furnishings fabrics wholesalers in the world. My export responsibilities require too much traveling. Within the last six months I have been to Europe, South America, Latin America, the Far East, and the



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Thierry Chevalley, SM '91  
Margaret V. Hughes, SM '91  
Donna D. Mayo, SM '93

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Middle East. I am home for a three-week breather before I make a return trip to South America. My son has an international collection of T-shirts."

James Clark has been appointed VP of NCR's new Software Products Division. James was formerly the general manager of the Cooperative Computing Systems Division of NCR, based in Columbia, S.C. James is now a full company officer at NCR, and his new responsibilities include the future direction and development of NCR Cooperation, collaborative computing software, ProcessIT, workflow business management system, the StarGROUP networking software system, StarPro, enterprise networking software, TOP END, transaction processing monitor, and the application development environment products. Congrats! In addition to getting an SB with us, he also got a master's at Sloan in 1981. . . . Beth Levin has written an interesting book: *English Verb Classes and Alternations: A Preliminary Investigation*. It was published by the University of Chicago Press. Beth got an SM from the 'Tute in 1979 and a PhD in 1983. Both were in Course VI.

Your secretary received a phone call from Steve Carlson. Steve is now between jobs, having just left Arco in Midland, Tex., where he was doing petroleum geology work, including modeling. He was primarily doing mineral exploration for the last five years, and prior to that, was working in oil and gas (as previously noted by our classmate George Todd, this is a trying time for the petroleum industry). In 1979, Steve married Kathy (nee Burton). They have two boys and two girls, ages 13 to 7. Kathy teaches English as a second language at a local community college. Steve speaks with Albert (Al) Wankel, formerly of Baker House, who is now a surgeon in Neenah, Wisc.

We have a letter from Gail Rubin Walker. "In August, my previous employer, Hancock Software, sold its product (Filemaster, software for file management on VMS systems) to Executive Software, then Hancock went out of business. I am now working for Belmont Research, Inc., in Cambridge. This is also a small company and over half the people there had been one-time employees of BBN (my employer prior to Hancock), so it's nice to work with people I know again. Belmont Research does research and consulting on computer applications in pharmaceutical and medical areas. This fall, my husband, Ed, and I separated, by mutual agreement, and we are in the process of getting a divorce. Although negotiating a divorce is not very pleasant, I must say I'm happier than I've been in years. I had been doing most of the child care and housework all along, so being a single parent isn't any more work. I hope other married people (especially mothers) are getting more out of marriage. Our two children (who will be 6 and 4 by the time this is printed) seem to be taking the separation well. We are trying to keep things amicable for the children's sake. They live with me and see their father frequently."

As for your secretary, between my computer business, trading, and family, I remain extremely busy. The passage of time seems to be accelerating. Certainly, developments in the computer field continue to move faster, and as for the financial markets, the roller coaster of the '90s continues, non-stop. And my children, Shana, 7, and Samuel, 4, keep me on the move

regardless of developments elsewhere, especially as their use of PCs continues to blossom.—Arthur J. Carp, secretary, Quantalytics, Inc., 220 Henley Rd., Woodmere, NY 11598-2523, (516) 295-3632, fax: (516) 295-3230

# 77

So sorry for my absence last issue, classmates. The deadline caught me just as we were moving, not, alas, to a new house, but to a temporary rental townhouse. Although

we managed to get our home sold, we did not find the right house to buy. So we continue our search. As you may recall, we have complete faith in our wonderful real estate agent (ME!) to find us the perfect place. I hope that by the time you read this, we will already be living there. In the meantime, please use the P.O. Box mailing address at the end of this column for your news.

We begin with the announcement of the prestigious George B. Morgan '20 Award going to our own Dave Dobos. Dave received the award in October during the Alumni Leadership Conference at MIT. The award is given in recognition of sustained excellence in all aspects of Educational Council activity. Dave is very active in the council in Columbus, Ohio, and we congratulate him on this achievement! . . . A beautiful postcard of Heidelberg arrived from Steve Gaskin this month. Steve noted the picturesque Christmas markets as well as the frigid weather there. He reported that "people really treat me well here once they hear I won the Nobel Prize for physics." He signed himself, "former nerd, now 'socially challenged.'"

Todd Glickman writes with the news that he has been elected a trustee of the Seashore Trolley Museum in Kennebunkport, Maine. He runs the operating training program there teaching fellow volunteers how to "drive" real streetcars, trolleys, and subway cars. He invites us all to come visit this summer! Otherwise, he reports, the weather business is "fair." He also noted that the incoming freshmen joining WMBR(FM) radio on campus this past year weren't even born when he did his first show there. He finds them enthusiastic, bright, and intrigued by the resurgence of the '70s music we used to listen to "while tooling away at 8.01."

Thomas R. Crawford, who is living in Solana Beach, Calif., continues to handle marketing for Qualcomm Incorporated's CDMA wireless division. He is also responsible for investor relations for the company. He finds the company's exciting activities and growth keep him busy, but he was preparing to throttle back for the arrival early this year of his first child. . . . Another recent parent is Marc Reitman. He and his wife, Ann Ginsburg Reitman, and his daughter, Nadine, now 6, welcomed son Jason, born in July 1993. Marc and his family live in Kensington, Md.

Another classmate in the metro D.C. area is Stephen K. Gourley. At the time of his writing, he was a major working at the Pentagon, anxiously awaiting the release of the lieutenant colonels' list in December. Stephen is a local rep for the LANDSAT Program, a joint DOD-NASA effort. He reports that Kristin is doing well as a business manager for a small tech firm. They are finding that their three children, ages 7, 6, and 3, keep all their spare time



well filled. . . . Our last bit of news is from **Matthew Sherman**, who is working at the Genetics Institute in Cambridge in clinical drug development on cardiovascular and oncology therapeutic agents. He also maintains a clinical faculty appointment and practice at the Dana-Farber Cancer Institute and Harvard Medical School.

We hope that the summer may bring you to the Washington, D.C., area. Please call Paul and me if you're in town, if only to chat and fill me in so I can update the rest of us! Continue to reach us at (703) 455-8459. Or write to—**Ninamarie Maragioglio**, secretary, P.O. Box 10315, Burke, VA 22009-0315

# 78

Please send news for this column to: **Jim Bidigare**, secretary, 9095 North St. Rd., NW, Newark, OH 43055-9538, (614) 745-2676

# 79

## 15th Reunion

Now I know why so few people have written lately—based on the spate of new babies,

you've obviously been busy doing *other* things! . . . **Barbara Biber** and her husband, **Charles Rizzi** (Brown '79), are enjoying their little boy, Peter, born on March 20 last year. Barbara is working part-time as a radiologist at the Maine Medical Center in Portland, giving her plenty of time to enjoy Peter as well as the great Maine outdoors. . . . **Joel Maddox** and his wife of six years, **Karen Perizzolo**, '82, had a son named **Jeffrey** last June. They moved to Saratoga, Calif., recently to be closer to Karen's medical practice, and to cut Joel's commute down to a manageable 20 minutes.

**Kenneth Murphy**'s first child, **Caitlin**, was born last August 11. Kenneth reports that "our baby was born 'high tech' style via *in vitro* fertilization—it really does work!" . . . **Gail Kaiser** and husband **Dan** had a son, **Matthew Alexander Duchamp**, last May 21. He was 9 pounds, 8 ounces at birth, and at 4 months old was weighing in at 20 pounds! Gail reports (objectively, of course) that he is wonderful in all possible ways.

**Allen Tracht** also has a new son, **Daniel Carothers Tracht**. In the meantime, his twins, **Michael** and **Diane**, continue to keep their parents busy with endless repetitions of "how?" and "why?" The Trachts live in Cleveland Heights, Ohio. . . . **Preston Vorlicek** and his wife, **Suzanne**, provided 4-year-old son **Christopher** with a new baby brother, **Brandon**, last May. Preston's new job as VP of Networks for Comstream resulted in the family's recent move to San Diego from Pismo Beach, Calif.

**David John Fillmore** is an assistant professor of interventional radiology at the University of Utah. His daughter, **Christina**, just turned 3, and the whole family is learning how to ski. . . . **Jeannette Wing** is back in Pittsburgh and the Computer Science Department at Carnegie Mellon University after a year's sabbatical at MIT. She writes, "I'm still dancing ballet, and recently started a new activity—tang soo do (Korean karate). I especially enjoy the high kicks and choreographed forms

because it's like dance, yet I also draw on my MIT fencing training to get me through the sparring. Last June I attended the lovely wedding of **Michele** and **Steve Kirsch**, '78. **Jim Roskind**, '78, also attended."

**Gordon Haff** is still in product marketing at Data General, though he recently started working again with Unix AViiON servers and workstations (after handling ECLIPSE mini-computers for a while). He also runs a shareware software business from his home and has gotten some mention of his programs (like Directory Freedom and The Last Word) in a couple of industry magazines.

**Michael Good** has left Digital to join Xten-sory Inc. as director of engineering. Xten-sory is a virtual reality software and systems integration company. Michael says, "If you are interested in applying VR to your business, contact me via e-mail at [mdgood@netcom.com](mailto:mdgood@netcom.com)." . . . **Dan Gauger** is still working for Dr. Bose's company, currently as chief engineer for noise reduction technology. For recreation, he enjoys movies, aikido, and snowboarding in the winter. Dan lives in Watertown, Mass.

Your faithful secretary just returned from a beautiful week in Bermuda. It's a wonderful place to be in December (the off-peak season). The temperature was in the seventies all week and there were no crowds anywhere. After a lifetime of rainy vacations, I may have broken my streak—seven consecutive days with no rain, not even an overcast day! Somebody up there must have taken a liking to me lately. Until next time—**Sharon Lowenheim**, secretary, 98-30 67th Ave., Apt. 6E, Forest Hills, NY 11374

# 80

*News from the West Coast:* **Laura MacGinitie** joined the faculty of Pacific Lutheran University in Tacoma, Wash., in the spring of 1993. She celebrated the 4th of July by

marrying **Richard Derevensky**. Laura had been living in New York and doing biomedical research. . . . **Jeffrey deRoulet** is also living in Washington (Woodinville). Although he reports it was a cold, wet summer, and the economy is soft due to Boeing and the airline industry weakness, his firm, Architects NW seems to be doing well. They are leading a five-office residential design consortium/merger and will commence national marketing in 1994. . . . Moving south to Fremont, Calif., we hear from **Jeff Jaycox**. Jeff moved to Silicon Valley and is in marketing with CADENCE, Inc. (Computer-Aided Engineering Design Tools for Integrated Circuit Design). He and his wife, **Karen**, have two children: **Brendan** (4) and **Colette** (2).

I received a nice letter from **Shlomo (Sherman) Elspas**, who is also living in California (Lomita). After attending the annual international meeting of the Israel Society of Anesthesiologists, he and his wife, **Rachel**, attended a Burton II mini-reunion of expat Yanks at the Jerusalem Hilton's kosher Indian restaurant. In attendance were **Robin** and **Andy Schwartz**, '79, parents of five, and **Lisa** and **Jeremy Barkan**, '81, newlyweds expecting their first child. They also visited with **Rabbi Shalom (Avery)**, '82) and **Chaya (Cheryl nee Walter)**, '84) Lampert and their four children at their home in Ma'alot near the Lebanese border.

# ClassNotes

By the time you read this, **Russell Blount** will probably be living on the West Coast also. In early 1994 he, his wife, **Deb**, and their two children will be moving from Philadelphia to **Graham, Wash.**, near Mt. Rainier. They are buying part of the Fix family homestead. His children **Andrew Richard** (Drew, 9 months) and **Pauline Acker** (Lina, 3 years) will be the sixth generation on the land first settled by Russell's mother's great grandparents. The change will be from a Philly rowhouse to two ponds, a barn, and 20 acres. It sounds wonderful!

*Moving to the East Coast:* **Tom Burgmann** has been living in Mississauga, Ont., since 1991 with his wife and two daughters, **Tamsyn** (9) and **Jocelyn** (6). He currently works for U.S.-based Detection Systems in Rochester, N.Y., as program manager developing a security system. He telecommutes from his home office and no longer fights the rush hour traffic. . . . **Richard Kocinsky** writes from Belle Mead, N.J. (near Princeton). Richard was married to **Sarah Colamarino** in January 1993 and spent a splendid honeymoon in St. Martin. He is still working at astro, now for **Martin Marietta** (formerly RCA then GE). . . . **Deep River, Conn.**, is home to **Barbara Locke** and her 7-year-old daughter, **Sarah**. Barbara has been a high school math teacher for five years and loves it. . . . **Chris Dunn** and his wife are the proud parents of **Graham** (born September 1993) and **Virginia** (1). He reports that Virginia enjoys her new baby brother and does an excellent imitation of his cry.

*Down South:* **J. Mark Karlen** is comfortable living in the north Dallas suburbs, hoping that health care reform doesn't send American medicine into a tailspin of dissatisfied patients from reduced quality of care.

That's all this month. Send more news from the South and Midwest to: **Kim Zaugg**, secretary, 549 Fairfield Rd., Canton, MI 48188, [vayda@erim.org](mailto:vayda@erim.org)

# 81

*Sharper Image:* **Robert Close** informs us that he and his wife, **Edna Kung** (Wellesley '81), were blessed by the birth of son **Benjamin** in November 1992, who loves dogs and playing basketball. When he's not home babysitting, Robert is doing research in medical imaging at Cedars-Sinai Medical Center in Los Angeles. He can be reached by e-mail at [close@csmc.edu](mailto:close@csmc.edu) and would love to hear from classmates.

*Promotions:* **Steven Barwick** has been promoted to associate professor of physics at the University of California, Irvine. Upon promotion, Steven and his wife, **Lauri**, purchased a new home for themselves and new son **Ian Thomas**. . . . **Thomas Barta** reports a promotion as well, last summer, even though things have been difficult for the drug industry lately. He and his wife, **Robin Hathorn** (Bryn Mawr '88), recently took a nice long vacation in Amsterdam, Brussels, and Paris.

*From Big Blue:* **Joseph Kesselman** is at IBM Research, applying the technology developed



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for the 1992 World's Fair to the automation of the Illinois state unemployment offices (the "TOUCH ILLINOIS" project). His remaining time is taken up with locksmithing, photography, and Walkabout Clearwater.

**From Silicon Valley:** Tony Von Ruden is currently working for Fastech Integration as a software engineer, and has recently become a homeowner in Palo Alto.

**The Neuro Network:** From Charlotte, N.C., we hear from Olin Harvey. Olin received an M.D. in 1985, then did his residency in radiology, and completed a neuroradiology fellowship in 1991. From 1991 on, he's been a practicing neuroradiologist.

**House Musician:** Edrick Vanbeuzekom has been practicing architecture since 1989 in his own architecture firm, doing residential and commercial work. In his spare time, Edrick plays blues, rock, and reggae in a band which includes a number of MIT alumni who wish to remain anonymous. His daughters, Anya, 8, and Veronica, 6, have (surprise!) taken a strong interest in math, science, and reading.—Mike Gerardi, secretary, 3372 Olive St., Huntington Park, CA 90255, (310) 553-5050 (w), (213) 587-2929 (h)

## 82

Nancy Huelsmann received the Distinguished New Engineer Award during the 1993 Society of Women Engineers National Convention in June. She recently accepted a six-month position in materials procurement in Barcelona, Spain, with Hewlett Packard. . . . David Prugh was the construction coordinator for Habitat for Humanity's first home in Athens, Pa. He writes, "Only MIT and Pi Lam could have prepared me for managing the chaos of a Habitat project and a full-time job at Du Pont and raising two kids!"

Stuart Basseches opened his own architecture office in Manhattan two years ago after completing graduate work at Yale University and working six years in New York, France, and Germany. . . . After finishing a PhD in statistics at Stanford University, David Shapiro drove across country, skiing and visiting Ted Weaver, '83, in Boulder, Colo. He is now doing a post-doctoral fellowship in biostatistics at the University of Rochester, working on a methodology to assess the accuracy of medical diagnostic tests; also helping medical researchers design studies and analyze results. Now that he has some income coming in, he reports that he is single-handedly bringing Rochester out of the recession.

Dinese Ellsworth left Morgan Grentell Gmbh in Frankfurt and joined Alan Patricot Associates as a director in March 1992 in Munich. . . . Pat Kinney is now a senior associate actuary at John Hancock and is chairman of an exam committee for the Society of Actuaries. For MIT, he is helping with the IRDF fund raising campaign. And for fun, he's playing with the Brookline Symphony and New England Philharmonic Orchestras plus a few other groups.

Robert Powell is back at Microsoft after a 10-year break. This time he is paving the information highway as part of the Advanced Consumer Technology Division. He's working with Jim Zamiska, '83.—Helen (Frax)

Fanucci, secretary, 502 Valley Forge Way, Campbell, CA 95008; new e-mail id: Fan-Group@aol.com

## 83

Promotions, awards, babies, let's get right to the news. . . . Pete Fader has been granted tenure at the Wharton School of the University of Pennsylvania. Pete will hold the position

of associate professor of marketing at Wharton. . . . Scott Haney was awarded the Fusion Power Associates Excellence in Fusion Engineering Award for 1993. Scott, who works for Lawrence Livermore National Laboratory, was recognized for his "educational record, outstanding thesis, and contributions to computational physics," including his "contributions and leadership to the development of the SuperCode, which is now in wide use for fusion tokamak device design." The award was established in the memory of MIT professor David J. Rose to recognize individuals in the early part of their careers who have shown outstanding technical accomplishment and leadership potential in the field of fusion engineering.

Layton Montgomery writes that after a year in the Ukraine, he is back in the United States and plans to be at UMass/Amherst for a year to finish a master's in international education. He then plans to return to Russia. Layton says that highlights of the year were teaching math at a math and physics magnet school, singing in an opera, teaching barbershop music to a few Ukrainians, skiing, and picking mushrooms in the Carpathian Mountains. Layton also kept busy with some consulting for a small private computer company, meditation, yoga, and reading *Bhagavad Gita* and the *Bible*. He was living in the picturesque City of Lviv. Layton says that the lows of the year were earning less than \$20 per month and playing too much Tetris.

Mike Thompson writes that he's working as an analyst with Kean Inc., a software consulting firm. For the past two-and-a-half years, Mike has worked on site at Bell Northern Research, the R&D component of Northern Telecom. Mike and his wife are expecting their second child in February 1994, which should come within a couple of days of their daughter's birthday. . . . Richard Schooler is happy to announce the birth of his daughter, Isabelle, on September 15, 1993.

Pace Willisson and Wendy Rowe wrote to tell us about an adventurous summer trip to Pace's hometown of Huntsville, Ala. The highlight was taking the kids to the Space and Rocket Center. Pace still does software consulting from home and Wendy spends all of her time chasing their two children, Eric, 4, and Alex, 2.

A friend from TDC told me the following, which has not been independently verified: John Jennings has been married "for like, four years" to Marty and is working at NASA Headquarters on technology-reinvestment programs. Joe Sabik is a medical doctor and is finishing his residence at Mass General. Joe was recently married.

Please take note of the new address below, and keep those cards and letters coming.—Jonathan Goldstein, secretary, TA Associates, High Street Tower, 125 High Street, Suite 2500, Boston, MA 02110



David Karlin is a senior development engineer at Freightliner Corp. He is a team leader

in cab simulation and test. Dave has two daughters, Orna (4) and Moriah (7), and is married to Hanna Roettgen Karlin, a self-employed dentist. . . . Steve Altes is building a business empire in Moscow and St. Petersburg, Russia. He invites alumni/ae interested in this exciting, new "adventure capitalism" to write him at: Ronin Corp., 5705 Wood Creek Ln., Suite 250, Centreville, VA 22020. . . . Our president, Diane Peterson, started a new position at TRW this past year as the manager of export/import compliance for the space and electronics group. She travels to Washington, D.C., often to meet with the State Department. Diane finally graduated with an MBA last year and is still living happily in Manhattan Beach, Calif. . . . Natalie Lorenz received scuba certification over the summer and plans to go diving in the infinitely warmer waters of Hawaii with her boyfriend. Her mom lives on the Big Island so they planned a Christmas celebration in Hawaii. In the spring she is planning a ski trip to Big Sky, Mont., after having spent a wonderful week in Telluride last spring. Natalie says she has been bitten by the ski bug. This past October Natalie saw a busy Jonathan Koch, '82, and Jonathan Wolf, '85, on a visit to Boston.

Stephen Adkins graduated back in '86 with an MS and then spent the next five years in Johannesburg, South Africa. In 1991 he returned to Washington, D.C., to attend Georgetown University. Stephen married the former Susan Little in January 1993, then graduated with an MBA in May and moved to Atlanta in June. He works as a software development manager at Aeronomics Inc., a "revenue management" consulting firm where the chief scientist is Ren Curry, an ex-professor in the lab where Steve did his MS. . . . David Gerber continues to serve in the U.S. Air Force as an F-15 instructor pilot at Tyndall AFB, Florida. He and his wife Louisa are expecting their second child. Technology says they are expecting a girl. . . . Thomas Drennen received a PhD in resource economics from Cornell University and now works for Sandia National Labs. He is still living in upstate New York with his wife, Laurel Dallmeyer, MD, and their two sons, Zachary and Skylar.

Ron Rubenstein is in the third and last year of his pediatrics residency at the Children's Hospital of Pittsburgh. He will be going to the Johns Hopkins Hospital for a fellowship in pediatric pulmonology in July 1994. . . . Peter Sterpe has been married to Tina Sabin (Wellesley '86) for five years. They are the proud parents of Paulina Clare, born June 14 (Flag Day—so they considered the names "Betsy" and "Ross"). Last time Pete was in the news he was working at Interleaf, but he is now with a software and consulting firm named JYACC. . . . Jeff Friedman and his wife Jennifer announce the arrival of Noah Daniel on September 14, 1993, weighing in at 7 pounds, 8 ounces—healthy and happy.

Eric Munro married Rebecca Yun-Hsuan Yang in December 1992. The bride wore a white long-sleeved satin and lace ankle-length gown (well, the alumni/ae office sent me the newspaper wedding announcement). Paul

Bradford was the best man, Victoria Yu the matron of honor. Eric and Rebecca were living in Cupertino, Calif., at the time. She was working as a marketing consultant for HP and Eric as a business manager at Maxim Integrated Products.

The recipient of our class scholarship this year is Rebecca Hill, a brain and cognitive sciences major. She is in her second year of UROP doing research in nerve regeneration in hamsters. Rebecca is captain of the varsity soccer team and also participates in varsity softball. She is going to study abroad at University of Queensland in Australia. Her plans after graduation include the Peace Corps and then medical school. Thanks to everyone for their contributions to the scholarship fund.—Howard Reubenstein, secretary, 28 Mitchell Grant Way, Bedford, MA 01730, (617) 275-0213 (home), hbr@mitre.org

## 85

Greetings all! The big news is that a listserver for our class has been created, so that you can get news about our class by internet and post messages to the class. To be placed on

the listserv, contact me at the e-mail address at the end of the column. Or, send mail to listserv@mitvma.mit.edu with the following message body: "subscribe mit1985 <your full name>".

Kevin O'Connell just finished a PhD in bacteriology at the University of Wisconsin, Madison, and recently began a postdoc with the Center for Microbial Ecology at Michigan State. . . . Alan Foonberg reports that all is well working at the Aerospace Corp.—he's been married for about five years with no kids, except for a yellow labrador retriever. . . . Althea Haylett-Rhodes and husband Rodney Rhodes were featured in *Minority Engineer* as husband and wife chemical engineers for Du Pont.

David Barto married his wife, Elizabeth, about 18 months ago and recently finished an MD/PhD. He and his wife are enjoying the midwest as David is in residency in laboratory medicine at Barnes Hospital. . . . Peter Tzanetos relocated to Citibank in New York City. He and his wife are awaiting the birth of their first child in December. . . . Michael Druding and wife, Cheryl, moved from Corning, N.Y., to State College, Pa. His work focuses on the glass parts for TVs.

Richard Hahn and Martha Chun were married in Beacon, N.Y., on October 17, 1993. Ray Lee and Jorge Bracer were present at the wedding. Richard plans to open a practice in child, adolescent, and adult psychiatry in New York, and Martha plans to practice orthodonty. . . . Catherine Chen is taking two years off from surgical residency at New England Deaconess Hospital in Boston to work in the laboratory of Judah Folkman at Children's Hospital.

Megan Claps is alive and well in Georgia. She attended veterinary school at Cornell and has been practicing small animal medicine for four years. She recently married Georgia Tech graduate Jim Gratzek, who is completing a PhD in food technology at University of Georgia. . . . Ajay Nahata just finished his first year in the PhD program in electrical engineering at Columbia. . . . Noelle Merritt is still working with IBM in southern California and truly enjoying the life there. Husband Art works at

## ClassNotes

Merisel, and they have two cats, Jimmy and Muffy. . . . Roberto Engels just moved from Brazil to Argentina with newest family member, Nicole, born July 1, 1993, to work for the oil industry firm, YPF.

That's it from sunny Pittsburgh. Send news and comments to Bill Messner, secretary, 5927 Alder St., Pittsburgh, PA 15232, (412) 361-4180, internet: bmessner@andrew.cmu.edu

## 86

Seasons Greetings! The big news this month is that our bundle of joy finally arrived. Jerad Connor Engebret was born during halftime of the San Francisco '49ers and Dal-

las Cowboys football game on Halloween. Having inherited his father's temperament, Jerad is a wonderful baby and we thoroughly enjoy parenthood. I'm still looking forward to that good night's sleep—all in due time, I suppose.

Pace Willisson is doing software consulting from his home in Medway, Mass. He, wife Wendy Rowe, '83, and their two sons recently visited Pace's hometown in Huntsville, Ala., where they spent much time at the Space and Rocket Center. . . . Irina Rakin is running a joint venture between a Russian manufacturing plant and Baxter World Trade Corp. that she started up. The plant makes surgical instruments in Moscow to U.S. standards for sale in Russia and export. She has been living in Moscow since January 1993, which she says is certainly different but always challenging. . . . Ellen Spero Wheatman and Steven Wheatman recently bought a house in Lower Gwynedd, Pa. Ellen still works for Oracle as a sales consultant and Steven works for Cabot Medical, a laparoscopic surgical equipment company. . . . Mark Kulbaski married Lisa Maki of Quincy, Mass. He then took a year off from residency in general surgery at Mass General to train in surgery in Plymouth, England.

Ramon San Pedro is still living in Houston where his daughter, Alyssa, is now 2. His wife, Sylvia Perez, '88, just started work as the algebra II teacher at the High School for the Engineering Professions. . . . Irwin Horowitz has completed a PhD in astronomy at Caltech. He has started a postdoc at Brigham Young University. . . . Thomas Chang graduated from Sloan School and moved to Sunnyvale, Calif., to work for Applied Materials. . . . Matthew Stenzel has moved to a new position of assistant professor of mathematics at the Newark Campus of the Ohio State University. . . . Tom Kurfess received a Presidential Faculty Fellowship from President Clinton in October. The award recognizes achievements in both research and teaching. There were 15 PFF awards given out in engineering.

Amy Ku is changing directions these days. After two years of dental school, she has decided to go to medical school and pursue a career as a doctor. . . . Betsy Salkind performed her comedy act at the MUB at the University of New Hampshire last October. Betsy decided to try comedy after becoming disillusioned.



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## GAZETTE

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sioned with the high stress and very analytical world of math and science. . . **Chris Medina** has moved from Los Angeles to Houston. He transferred with his company, Shell Oil Co. He now works in the General Engineering Department on several projects located in Louisiana, St. Louis, Sacramento, and Houston. They were finally able to buy a house and Chris enjoys being able to take advantage of public transportation to commute to work each day. No more parking lots on Highway 405.

**Carolyn Beer Zerkle** sent me a Christmas card. Carolyn and hubby Dave are both working at Los Alamos National Lab in New Mexico. Carolyn is managing a new construction project: the renovation of a laboratory special storage facility. If all goes as planned, this should take her through 1999. Daughter Sandy, 2, keeps them occupied in their spare time (Carolyn sent a picture and, boy, is Sandy cute).—**Mary C. Engebret**, secretary, 21305 Arrowhead Court, Ashburn, VA 22011, (703) 729-6568

# 87

Good job on getting news to me this month—I did not even have to ask! We now have over 200 classmates on our e-mail list (MIT1987@mitvma.mit.edu). If you or someone you know is not on it but should be, please send me his or her e-mail addresses.

First, a rumor submitted last month by **Joe LaRocca** is put to rest by **Dave Meer**, who writes, "It is true that I am currently finishing graduate school at Stanford and am scheduled to defend my thesis in mid-January. I have not, however, been doing strip-o-grams to earn extra money, although I am sure that it would pay more than a PhD student earns..." Dave also writes that he had some interesting experiences this past summer as he and his wife, Kelli, spent five weeks traveling in south-east Alaska. Highlights included losing a 45-pound king salmon to a 2,000-pound sea lion, acting as witnesses for a German couple's wedding wearing hiking boots and shorts, and sitting on a beach littered with icebergs, watching huge chunks of ice calve off of a 400-foot-high, 2-mile-wide glacier face. Dave has been in touch with **Dave Tuveson**, who is finishing an MD/PhD this year and is currently applying for internships. He and his wife, Michelle, '88 and their 6-year-old son, Timmy, will probably sell their house near Baltimore this year when they figure out where they are going. Finally another rumor which needs to be confirmed: that **Andrei Konradi** has left his postdoc position at the Scripps Institute to start a captive breeding program for the almost endangered California tiger salamander.

An update from **Patrice Allen**: Kala JoAnne Allen was born on November 9th 1993, weighing in at 6 lbs., 1 oz. She came out screaming and hasn't stopped yet. All are doing great (but presumably a bit sleep-deprived) and are enjoying the new challenges of parenthood.

**Adriana (Praddaude) Kurfess** and her husband, Tom, '86 spent the summer working at the Lawrence Livermore National Labs. Besides enjoying the San Francisco area, highlights of their summer included a 5th anniversary camping trip to the Grand Canyon. **Adri-**

ana is in her third year of teaching 7th and 8th grade math and science in Pittsburgh, Pa., and Tom is still at Carnegie Mellon.

**Kent S. Jeffery** has decided to do what seems to be the "in" thing for an MIT graduate to do: He quit his job as an applied aerodynamicist at Boeing to return to school. After selling the house that they spent three years renovating extensively, Kent and his wife moved to Hood, Ore., so that he could begin medical school at the Oregon Health Sciences University in Portland. After graduating, Kent hopes to work as a family-practice physician.

**Andy Sterbenz** recently took command of A Company, 11th Engineer Battalion at Fort Stewart, Ga. He reports that they have been training hard for a rotation at the National Training Center, but may be diverted to Somalia. Having just finished a three-month modernization period, Andy expects that his force will be the best-equipped and prepared where ever they are sent! Andy recently spoke to **Chuck Davis**, who just finished an MBA and is living with his wife, Jan, in Plainsboro, N. J. Chuck works for a subsidiary of Kimberly-Clark in the area of finance.

**Jim Bernabeo** e-mailed to say that he just finished a master's at RPI's Hartford, Conn., graduate center, and will immediately begin to work towards an MBA there. In addition, Jim works for United Technologies in Hartford, specifically in the area of wind-tunnel modelling, though he has also done some combustor work for Pratt and Whitney. On the home front, his wife, Joanne, gave birth to their son Andrew this past August, and he is already old enough to be getting into just about everything!

**Cheryl Larivee Elkins** is excited about her impending move back to Boston, where she will be working for Astra USA (the U.S. subsidiary of AB Astra of Sweden). At Astra, Cheryl expects to be doing formulations development, which involves developing different forms (i.e., tablets, oral solutions, injectables, etc.) of the same drug. This is similar to what she did while working for American Cyanamid, in New Jersey, where she worked for almost three years in the Animal Health and Nutrition Division. The new job, while similar, is in the area of human rather than animal pharmaceuticals, and will also have more management responsibilities.

**Greer Tan Swiston**, her husband, **Rob Swiston**, **Stan Oda** and his girlfriend, **Gina**, and **Eugene Pan** all traveled down from Boston to New York City this past November where they attended a party thrown by **Jay Cohan**. Lots of Bakerites were there, including **Dave Jesurum** and his fiancée, **Pam**; **Gene Cohen** and his wife, **Andrea**; and newlyweds **Jim Koenig** and **Stephanie Levin**, our class agent and president (and I am STILL waiting for them to write in about their wedding, which was rumored to have been a MAJOR event!). At the party, I am sure that one of the main topics of conversation was the tour of the Caribbean by sailboat that some of the aforementioned were planning for the end of November (again, details would be appreciated!).

**Valerie Brown**, **Kip Fern**, **Terry Huang**, **Greg Marek** (Stanford '87), **Ethan Foxman**, '88, and **Karen Tsuei**, '88, all converged on Los Angeles on November 20th to celebrate the wedding of **Florence** and **Kelvin Phoon**. Kelvin is an operations management consul-



tant for Pittiglio Rabin Todd and McGrath in Costa Mesa, and Florence is a QA analyst for Pacific Biotech. The wedding was especially memorable for two reasons: the Rose Parade marching band was practicing on the road adjacent to the church, and there was a fistfight between the photographer and the videographer during the ceremony. Luckily, lots of the wedding guests brought their own cameras, and Kelvin says that pictures of the ceremony and reception are starting to trickle in.

Jane Fisher, '89, and Christopher Monroe got married last August 7th in Salem, after dating for 8 years! The reception resembled a Next House 5th East reunion, with over 30 MIT alumni/ae showing up and making it quite a party. They honeymooned for a couple of weeks in Paris and western France, but say that they had to (unfortunately) come home because they bought roundtrip tickets! Jane and Chris currently live just west of Denver, where Jane is an actuary with Life Partners Group, a small life insurance corporation south of Denver. Chris received a PhD in physics from the University of Colorado at Boulder in 1992, and is in the process of wrapping up a post-doc at the National Institute of Standards and Technology (NIST) in the area of atom-trapping and laser-cooling.

John Slater deserves special recognition for sending me the first actual letter (as opposed to e-mail or MIT donation form) that I have received in a long time! He and his wife, Amy Beth Van Atta (an absolute dream, according to John!), were married on April 24, 1993, in San Francisco. They met in Chicago, and now live in the Bay Area. John has been very busy this past year helping to launch the Apple Newton, and his wife is moving up the ladder at Cable and Wireless, an international telecommunications services company, where she is focusing on the biotechnology industry. John and Amy Beth highly recommend New Orleans during the Jazz Festival, which is where (and when) they spent their honeymoon. John has run into Diana and George Apostol, as well as Andy Vyros, '88, in the Bay Area.

Briefly... Navy Lieutenant Michael Schimpf is currently stationed on board the USS *America*, which has been operating in the Adriatic enforcing the "no-fly" zone over Bosnia-Herzegovina. His squadron, which flies the F-14A Tomcat fighter, has had the opportunity to visit Trieste, Italy, and Corfu, Greece. ... Neal Hoyer says that he will have started a new job at Ford in Dearborn on January 3rd. The new job involves Finite Element structural analysis of engines. Dave Graham also works in the same division at Ford. ... Irene C. Griff received a PhD in molecular biology from Princeton this past year, and is now a postdoctoral fellow at Johns Hopkins Medical School. ... Salvador Castillo recently separated from the Air Force, and is now pursuing a PhD at the University of California/Santa Barbara in the area of educational policy. He is also working as an Air Force reservist in launch support at Vandenberg Air Force Base. ... Robert A Biedenbarn reports that he is living near Cincinnati with his wife, Andrea, and his 2 children: 5-year-old Isabella and 2-year-old Carlo. ... Lauren Mahorter Snellgrove is working in the area of experimental fluid dynamics at the NASA/Marshall Space Flight Center in Huntsville, Ala. She married James

Glenn Snellgrove, a computer scientist who is originally from Georgia, on September 14, 1991.

Mark Harysch has relocated to the KI Sawyer Airforce Base (near Marquette, Mich.) due to the closing of Loring AFB in Caribou, Maine. By the time this is published, Mark and his wife, Sherry, should have already had their first child, who is expected in January. ... From a clipping in the *Metuchen-Edison Review* (Edison, N.J.), we hear that Stephen Hoening is engaged to marry Melanie Paige Derman in April. Stephen graduated from Columbia College of Physicians and Surgeons and his fiancée is a graduate of Brown and the Albert Einstein School of Medicine. Both Stephen and Melanie are surgical residents at Beth Israel Hospital in Boston. ... Christine (Keherley) Dorn writes that she lived in Strasbourg, France for the past year, and is now doing student teaching in French in Boise, Idaho. She and her husband plan to move to Germany next year, where she will hopefully find a teaching position. ... Jerry Hershkwitz is already in Germany, working on a six-month assignment for Motorola in Munich. He is assigned to the same project on which he was working while at Motorola's Austin, Tex., facility...

Until next month.—Jack Leifer, class secretary, 2703 Swisher Street, #202, Austin, TX 78705; phone: (512) 472-7507, fax: (512) 472-7546, e-mail: leifer@ccwf.cc.utexas.edu or MIT1987@mitvma.mit.edu

# 88

This is about the time that we would all be coming back to class after spring break and getting ready for mid-terms. Tell us where you went for spring break this year! Here's the news. ... Stephanie Keenan writes that she has joined her husband, Jim, in Iceland where he is stationed at the Naval Air Station dental clinic. She enjoys the country, but writes that the weather takes some getting used to. They are expecting a new addition to their family soon. Stephanie received an MA degree from the College of William and Mary in August and writes that "...after all that work in American studies, [she] eventually found a job working for the government in engineering of all things," and is in charge of planning for future construction projects on the base. She was back in the States for the wedding of Angela Polen, '90, where she saw Kimber Lynn (Zinger) Drake. Kimber Lynn married Steve Drake on September 12, 1992. She is a mechanical engineer at ECRM and has been very active in musical theater. Kimber Lynn recently performed in *A Chorus Line* and *Guys and Dolls* at the Turtle Lane Playhouse.

Glenn Serre is employed at Gain Technology, Inc. (a division of Sybase) in Palo Alto, Calif. Glenn writes that he is a release engineer, officially, but is actually more like a professional hacker, for a multimedia application development system (Gain Momentum). Glenn is still seeing Ting and is buying a house in Mountain View, Calif. ... Mark Luettgen finished a PhD in Course VI last May, and is now working at a small company called Alphatech out in Burlington, Mass. ... Susan Lee is currently a grad student at Cornell University. Susan will receive a PhD in mathematics in June 1994.

# ClassNotes

Erik Heels and his wife, Pirjo, are expecting their first baby on April 7th. Pirjo is working as an RN/BSN at York Hospital, and Erik is in his second year of law school at U. Maine Law. Erik recently completed a two-year project that is now available via e-mail entitled: "The Legal List, Law-related Resources on the Internet and Elsewhere." If you want a copy contact Erik (heels@justice.eliot.me.us).

David M. J. Saslav is working at Oracle Corp. with Sharmini Nathan in the Desktop Products, Interoperability Testing Group. He married Melissa Smith (U. of Montana '84), the development director for the renowned Kronos Quartet. David is singing in two Bay Area choral arts groups and has started a small singing group from amongst the many musically inclined and highly talented Oracle employees, called the "SQL\*Notes". David writes, "Such harmonic confluence abounds out here in the Silicon Valley." One of the members is Christopher Andrews who, like David, was an MIT Logarithm; another was a Harvard Veritone, and a fourth was a Wellesley Widow (who married a fellow AI Lab member, Arthur Gleckler). David is also using MIDI as the basis of a small living-room business.

Peter H. Schmidt graduated with a master's from Sloan in '92, and is now working at Midnight Networks, a network software development and consulting firm that he started with Art Mellor, '85, Hollie Schmidt, '87, SM '92, and John Reardon, '90. They have been in business for a little over a year, and are up to seven full-time people, with plans to hire more in the next few months. They are having a great time running their own business, but it does not leave them much time for anything else. Hollie and Peter are renting half of a big duplex in Waltham, five minutes from the office. Peter reports that Joan and Dave Kaffine have a new daughter, Meghan Elizabeth.

Jennifer Raeder-Devens and Douglas Devens are spending 1994 in Normandy doing research for Elf Oil Co. of France. ... James Robinson graduated cum laude from St. John's University of Law in June of '92. James is currently an associate at the law firm of Meyer, Meyer, & Metli in Smithtown, N.Y.

Jeffrey Szilagyi, who is currently an associate at J.P. Morgan in New York, returned from Singapore in late September, where he saw Jesse Ho (Sloan SM '92) in Hong Kong. Jeffrey is also enjoying season tickets to Jets football and Knicks basketball games. He writes that work is going well, and that he is looking forward to recruiting at Sloan.

Robert Swiston and Greer Swiston, '87, write that Rob is doing well at FASTech, a young start-up that was recently ranked in *Inc.*'s top 500 companies (they were ranked #1 in New England!). Greer continues contract work at Fidelity Investments.

Steven Schondorf and his wife, Kristin, '91, write of their wedding in July 1993 at the Ford Mansion in Dearborn, Mich.

I would like to thank all of you who wrote, and encourage those of you who didn't to do so soon! Please write and if possible include



# Puzzle

Continued from Page MIT 63

## Better Late Than Never

**1990 Apr 2.** Frank Rubin has found (with his faster computer) that 39,402,191,713 is prime and if one replaces (all three instances of) 1 with any other digit, the result is still prime.

**1993 Jul 3.** Frank Rubin points out that this problem is sometimes called Boneparte's theorem, after its discoverer.

## Other Responders

Responses have also been received from K. Bernstein, C. Brooks, J. Bross, A. Dehnel, R. Doherty, M. Fountain, F. Furland, J. Hahn, W. Hartford, R. Hess, R. Holt, A. Katzenstein, J. Keilin, S. Levitin, M. Lindenberg, N. Markovitz, J. Miller D. Moyer, T. Pappas, W. Peak, K. Rosato, F. Rubin, R. Sackheim, E. Sard, H. Sard, I. Shalom, S. Shalom, R. Sinclair, N. Tsang, N. Wickstrand, and K. Woods.

## Proposer's Solution To Speed Problem

Bookkeeper; boob-bookkeeper; brasssmith. Because 7 8 9. Because the Hudson is not a dammed river.

news on other classmates that you have kept in touch with. Keep sending that e-mail to singer@mit.edu; for those of you who prefer snail mail, send to: Catherine Suriano Singer, secretary, 131 Main Street #3, Andover, MA 01810.

# 89

## 5th Reunion

The reunion is right around the corner, and I hope people are starting to make plans.

For more info about the reunion, call the new toll-free MIT Alumni/ae Association number: 1-800-MIT-1865.

If you haven't received any reunion mailings by now, it is possible that the Alumni records have a different class affiliation listed (if you graduated in more or less than four years, or if you were in a co-op program). To fix that, just call the toll-free MIT AA number.

Our Class Scholarship fund has awarded another scholarship this year, to John Chiou, '94. John is a senior in the Biology Department, and plans a career in medicine. John was a TA for "Introduction to Experimental Biology" last spring, and his UROP involved cloning and sequencing of gene fusion in *E. Coli* for the purpose of implementing improvements to that course. John has assisted with research at the Boston Heart Foundation, and continues to volunteer several hours each week at Children's Hospital. Please consider designating your gifts to our scholarship fund so that we can continue our support of stu-

dents like John.

Submissions for the class calendar are still trickling in, so please send those pictures or video tapes (either VHS or 8 mm). All submissions will be returned. We'll be publishing the school-year calendar, which will feature pictures of classmates, families, and other alumni/ae events, shortly after the reunion.

Here are this month's list of people to please write in: Zsuzsanna Gaspar, Frederick Kloer, Cheryl McCullum Smith, Nat Seshan, and Fei Wang. What are y'all up to? If anyone knows about any of these people or anyone else, please write in!

Jon Lyszcza graduated from the Uniformed Services University of the Health Sciences, was promoted to lieutenant, and is now serving as a physician in the Navy.

David Campbell, Jr. finished his second deployment to the Mediterranean with the Navy Seals, and is planning on leaving the Navy, hiking the Appalachian Trail, bicycling across the country, and finding a job in the alternative energy field.

Eric Reifschneider became a member of the Illinois bar in November '92, and completed his first year as a corporate lawyer with Katzen Muchin & Zauis, Chicago's fourth largest law firm. Eric is a member of the firm's technology group, and has been reviewing and drafting software license, consulting, and confidentiality and noncompletion agreements. Eric has assisted clients in venture capital transactions and has also worked on several White Sox player contracts.

Barry Margulies writes that he is "still slaving away in grad school, still at Hopkins, seeing other alums come and go (mostly come, though)." Also in Barry's program are Larry Buxbaum, '87, and Pierre Chevray, '87, both MD/PhD candidates who are the same year as Barry in the PhD program. Newer arrivals include Eleanor Hoff, '91, and Teresa Zimmers, '90, who just started after a few years at NIH. Barry still shares a bench with Mary-Elizabeth Harmon, '90, in Wade Gibson's lab, experimenting on human cytomegalovirus (human herpes virus 5).

"Things have been going better, research-wise, over the last few months; Lady Science has actually been smiling on me. I hope this luck will last all the way to graduation..." Barry writes. Barry has also started giving back to the 'Tute: giving his first interviews for undergraduate applicants this year. Barry was excited that one of his interviewees was accepted early. "Oh, what a feeling to be a part of someone's future like that!"

Barry also writes that Alice Lin is in her second year in a PhD program at Tufts School of Medicine downtown. She just passed orals, and "is a model scientist (as always)." Miky Ishida is now living in Seattle, temping until she can get a job in an architecture firm in the area. Miky recently moved from LA because of the better job market in Seattle. Christopher Wolfe, '87, and Ellen (Lin) Wolfe, '88, moved back to Schenectady so that they could stay employed with GE. They had their first son, Nicholas, in September.

Tom Farkas writes about his August 15th wedding to Julie Primost (Tufts '91). Among those attending the wedding held in Red Bank, N.J., were Alex Rosen, who was the best man; groomsmen Ira Scharf, Brian Luschwitz, and Arnold Zipper; Joe Lichy, Dean Ebesu, John Ofori-Tenkorang, David Perreault, SM '91,

Joaquin LaCalle-Melero, SM '92, Douglas Fleckner, '64, Oscar Fleckner, '63, Mary Eisenberg, '64, and Dave Tutelman, '63.

Tom and Julie honeymooned in Italy for two weeks, visiting Rome, Pompeii, Florence, and Venice, and had a wonderful time. Tom and Julie are now living in Ossining, N.Y., where Tom is working at Philips Labs on advanced development of compact fluorescent lamps. Julie commutes to NYC, where she is a Latin teacher at Brooklyn Poly Prep School. Tom and Julie plan on attending the reunion, and Julie is looking forward to the reunion even more than Tom!

Well, that's it for this month. Thanks again to everyone who wrote in, and I hope everyone is planning those reunion trips! Please send news and photos! Thanks!—Henry Houh, secretary, 4 Ames St., Cambridge, MA 02142; phone: (617) 225-6680, fax: (617) 253-2673, e-mail: tripleh@mit.edu or hhh@mit.edu or henry\_houh@mit.edu

# 90

The MIT Alumni/ae Association has informed us of the death of our classmate Sabrina Goodman. Sabrina lost her battle with cancer in early November. She died peacefully among her family and friends at her home in California. At the time of her death, Sabrina was a student on medical leave from the University of Rochester, where she had been pursuing a PhD in psychology. At MIT, Sabrina received dual bachelor degrees in cognitive science and mathematics. She was a resident of the Fenway House, a member of Alpha Phi Omega, and active in the Tech Random Music Ensemble and the Experimental Study Group (ESG). A memorial service was held in early December in Huntington Beach, Calif.

In other class news, Ed Hahn was in Boston in mid-November to visit with Chi Phi alums, including John Lee, '89, Jim Deeds, '89, Jeff Welch, '91, Ken Jung, '91, and Joe Pacatte, '91. They had a barbecue and proved that you can still have an awesome barbecue in 20 degree weather. Ed is now working for TWA in aircraft engineering in Kansas City. . . . Ken Woolner is a software developer for Oracle Corp. in Redwood Shores, Calif. He's also pursuing a master's degree in engineering-economic systems at Stanford. In Ken's spare time, he runs a baseball league. . . . Charles Li writes from Minneapolis, Minn. Charles is finishing his final year of medical school at the University of Minnesota and waiting to find out the location of his residency program in general surgery. . . . Rachel McCarthy is also finishing up medical school. Rachel is at the University of Florida.

Jema Gonzalez is finishing up an MBA at Wharton, majoring in strategic management. Jema spent her past summer working as a management consultant at Deloitte and Touche in northern New Jersey. . . . Maureen Fahey has just received a ScD degree in materials science at MIT. She has since started working at 3M in Austin, Tex. . . . Also in the Austin area is Paul Anderson. In fact, Paul recently had a housewarming party where fellow alums Samir Nonega and Steve Peltzman were spotted. . . . Pankaj Vaish is now assistant vice-president at Citibank's Global Finance Department in New York City.



Pankaj trades interest-rate contracts and foreign-exchange contracts, and provides customers with innovative ways of reducing risk.

**Flora Feng** is in law school at Georgetown. She lives in the heart of Washington, D.C., just a few blocks from the Capitol. Before starting school at Georgetown, Flora had worked for three years as an engineer in distillate fuel additive technology at Mobil Research & Development Corp. Then she spent a summer studying Chinese and working at a law firm in Taipei.

Our class president **Joe Babiec** writes to us about the Class of 1990 clock project/gift. Currently core concepts of the clock design are being reviewed and approved by class officers and MIT administration. Hopefully, if all goes as planned, construction of the clock would begin in late 1994 and be completed in time for our fifth-year reunion. If anyone is interested in more details about the clock project, please give Joe or myself a call.—Please send news to **Ning Peng**, secretary, 483 Beacon St., #41, Boston, MA 02115, or [ning@athena.mit.edu](mailto:ning@athena.mit.edu)

# 91

Congratulations to **Ken Shimborg** and **Betsy Pollack** (Wellesley '90) who were married in Cleveland last May! Attending the wedding were **Mike Powers**, **Matt Kaminsky**, **Pete O'Neill**,

**Steve Tucker**, **Craig Smith** and his wife, **Merritt**, **Gayle Gilgore** and **Will Schnorr** (who were married later in the summer), **Tom Cole**, **Laura Pitone**, **Eric Nudelman**, '90, and his wife, **Tricia**, **Jeff Meyer**, '90, **Chris Massa**, '90, and **Fran Lee**, '92. Ken and Betsy spent "two wonderful weeks" exploring Greece during their honeymoon before moving to New York City's Upper East Side. Betsy is the assistant director of development and public relations at the Inwood House, an organization that works with pregnant and parenting teenagers. Ken is an associate at J.P. Morgan Securities and spends most of his time in the mergers and acquisitions area.

**Tina Lee** works in Hong Kong for Morgan Stanley Asia Ltd. in the investment banking division. . . . Fidelity Investments recently promoted **Paul Antico** to a position as analyst and mutual fund manager. In November, Paul became one of the youngest analysts in the country to manage his own fund—Fidelity's Select Developing Communications fund—which holds about \$275 million. Not only is Paul happy about achieving his dream of "managing money," but he also made his debut into the elite Back Bay social order when he hosted a very elegant holiday party last December. . . . **H. Cristina Chen** is a member of the National Association of Asian American Professionals, and was recently recognized as the "1994 Miss Chinese Friendship Ambassador of Chicago."

**Kyle Heironimus** married **Beth Ellis** in December 1991. Kyle is now making security systems at Digital Monitoring Products in Springfield, Mo.

My collection of postcards is gathering dust! I'm too lazy to dust them off, so please send me some shiny new ones with news of your travels and activities. Please send news to: **Andrew Strehle**, secretary, 566 Commonwealth Avenue #406, Boston, MA 02215, (617) 262-3495

# 92

Spring is upon us once again. The rain is making everything fresh and green, the flowers are beginning to bloom, and I am looking out the window at a mountain of snow right

now. The snow holds pretty well through June in the Rocky Mountains. Last year I skied on Memorial Day, but it is Christmas-time right now. You may wonder why I am writing the April column in December. Well, deadlines for *Technology Review* are approximately four months before the actual issue. Just a note in case any of you get anxious wondering where your news has gone. All I can say is—patience.

**Reggie Abel** is at Georgia Tech, where he finished a master's in aerospace engineering in December, and he is now continuing with the PhD program there. He sees **Alou MacAlou** quite often as they are in the same department at Georgia Tech. Reggie is on educational leave from Boeing Commercial Airplane Group in Seattle. He occasionally returns to Seattle to do some research, and when he was there last summer, he ran into **Warren Chen**. Reggie says, "Life is a lot warmer in Atlanta."

**Sande Chen** finished a master's in economics at the London School of Economics and Political Science last spring and then toured Europe. She is now at University of Southern California film school majoring in cinema-TV. She's in the graduate screenwriting program for an MFA. Sande says it's been very hectic: filming, editing, casting, directing, scheduling, acting, and screenwriting. She wants to personally thank **Jean Yoshi** and **Anita Hsiung** ('91) for providing props and materials for her upcoming shoot, which is set at MIT where she hopes to see **Ravi Soundaravajan** if he can tear himself away from the lab.

**Robert B. Pember** returned in September from a six-month Mediterranean, Adriatic, and Red Sea deployment aboard the guided missile frigate *USS Hawes*, homeported in Charleston, S.C., as part of the aircraft carrier *USS Theodore Roosevelt* Battle Group. The frigate helped enforce the U.N. sanctioned "no-fly" zone over Bosnia-Herzegovina while operating with NATO Standing Naval Force Mediterranean. Aircraft from the battle group also supported Operation Provide Promise, monitoring humanitarian air drops into the former Yugoslavia. Additionally, the battle group proved valuable as a tool of foreign policy following a U.S. missile attack on Iraqi intelligence-gathering facilities. *USS Hawes* transited on short notice from the Adriatic into the Red Sea to assist in Operation Southern Watch, enforcing a "no-fly" zone over southern Iraq. During the deployment, the ship also participated in the Bulgarian naval operation *Breeze '93* in the Black Sea, with units from the Bulgarian and Turkish navies. Observers from Russia, Greece, France, Romania, and the Ukraine were also involved in the exercise. Training included convoy maneuvering and simulated sanction enforcement.

**Manny Voumvourakis** is the financial consultant president of EMCO Equities Corp. . . . **Elaine Lo** received a master's in mechanical engineering from Stanford University last June and is currently attending law school at Northwestern University. . . . **Stacey Au** fin-

# ClassNotes

ished a master's in mechanical engineering at University of California Berkeley in December, and she is now working with Sandia National Laboratories in Livermore, Calif., doing multimedia work on archival systems.

**Heidi Goo** is currently a second-year medical student at Howard University in Washington, D.C. She is considering specializing in pediatrics, geriatrics, ophthalmology, or rehabilitation. . . . **Tina Grosskopf** is getting married—to whom she did not say. . . . **Jacqueline M. Moore** finished a master's in aero/astro in February, and in March, she started her first Air Force assignment at the Los Angeles Air Station working for the Air Force Space Systems Division. Jackie writes that **Matt Mullins** and **Jim Havranek** are both working for the Air Force in Albuquerque, N.M.

That's all for now folks. Write to me a lot, and thanks for all your support. By the way, if you want to visit someone in Aspen, better do it quick. I'm going back east by this fall latest.—**Leslie Barnett**, secretary, 42575 E. Hwy. 82, Aspen, CO 81611, (303) 920-1988, fax: (303) 925-9389

# 93

Please send news for this column to:  
**Mari Madsen**, secretary  
12-16 Ellery St., #405  
Cambridge, MA 02138



## Moving?

Be sure not to miss a single issue of **Technology Review**.

Please give us:

- Six weeks notice
- Your new address & zip code
- Your old address & zip code or your mailing label

Send to: Alumni Records  
MIT-Bldg. 12-090  
Cambridge, MA 02139  
or call (617) 253-8270



# CourseNews

## CIVIL ENGINEERING

From Brooklyn, N.Y., Alex E. Friedlander, SM '65(I), PhD '69, writes: "This year I became senior director of schedules at the NYC Transit Authority. I am responsible for all bus and subway schedules, and work schedules for train crews and bus operators. I have also developed a second career in my spare time as a genealogist and am a nationally recognized expert in Jewish genealogical research. Son David is a junior at Vassar College, daughter Paula is a senior at Hunter College High School. I've been married for 24 years to Eija Malkki of Savonlinna, Finland." ... Martin Hawkes, SM '87, reports: "After six years working on the Central Artery Tunnel Project with Parsons Brinckerhoff Quade & Douglas, I have joined W.A. Marr, SM '72, PhD '74, (ex MIT Building I staff) at Geocomp in Concord, Mass., where we endeavor to apply and promote the use of computer technology to all aspects of geotechnology." ... From Wilmette, Ill., Joseph Burns, SM '84 (I, IV), writes: "I am director of LeMessurier Consultants' Chicago office, providing structural engineering services on projects in the Midwest. I was an adjunct professor at the University of Illinois at Chicago the past several years, teaching structures courses and design studio in the Architecture Department. I recently joined the faculty of ArchiWORKS, Chicago's new school of architecture, set to open September 1994. Watch for posters and send for our program prospectus."

John J. Plaisance II, SM '85, sends word: "I married Diane Breeden on February 7, 1993 and we expect our first child in December 1993." ... Robert C. Reeves, Jr., SM '89, has been selected by Aetna Life & Casualty in Hartford, Conn., as the managing director of real estate valuation and portfolio analysis. Prior to accepting his new position, Reeves was director of corporate and real estate financial services at Kenneth Leventhal & Co. in Houston, Tex., where he worked on the liquidation of several billion dollars of real estate portfolios through the Wall Street credit markets. ... William A. "Tony" Thomas, SM '66, a research hydraulic engineer with the U.S. Army, recently received the Hans Albert Einstein

Award from the ASCE. The award honors engineering contributions concerning erosion control and waterway development. Thomas was cited for "pioneering work in the modeling of sediment transport." He was also recognized for his research work with the U.S. Army Engineer Waterways Experiment Station in Vicksburg, Miss. Thomas has received the Army's Decoration for Meritorious Civilian Service Award and the Commander and Director's R&D Achievement Award. He also received the Hydraulic Engineering Achievement Award from the Mississippi Section of ASCE.

Fred W. Blaisdell, SM '34, was presented with the 9th Hydraulic Structures Medal by the ASCE. Blaisdell retired from the Agriculture Research Service in 1986, after spending more than 50 years as a hydraulic engineer with the U.S. Department Agriculture. Blaisdell was cited for many developments, including "the standard for the St. Anthony Falls Energy Dissipator, thousands of which have been designed and constructed throughout the world." ... Peter Likins, SM '58, Lehigh University president, has received an honorary degree from Czech Technical University in Prague, the Czech Republic, last December. The honorary degree of Doctor of Technical Sciences was presented to Likins for his lifelong scientific contributions and he was cited for "lifelong work, important scientific projects, and prestigious merits in science and education." Likins has been president of Lehigh since 1982. "During his tenure, the university was selected as the site of three NSF centers dedicated to strengthening U.S. science and technology; the Iacocca Institute was created; and Lehigh acquired and developed the Mountaintop campus, which gave the university land and space needed for Lehigh's expanding education and research programs," states a university press release.

*Alumni may send info for Course News to [mitalum@mitvmc.mit.edu](mailto:mitalum@mitvmc.mit.edu)*

## MECHANICAL ENGINEERING

From Cupertino, Calif., Graham Skinner, SM '82 (II, XIII), writes: "I have enjoyed my 10 years of work for Lockheed's Marine Systems Department in Sunnyvale, Calif. Patricia and I

have adopted two delightful children—Mollie (now age 4) and Colton (now age 1)." ... Patrick R. Turner, SM '85, reports: "I was promoted to VP for product development at Mechanical Dynamics, Inc., in January 1993." ... Charles R. Cornell, SM '69, writes: "I have served as VP of DAI Technologies since co-founding the company in 1983. DAI has recently joined with Synchro Start Products, Inc., to pursue broader worldwide markets for electronic control systems for diesel and alternative fuel engines." ... From Urbana, Ill., John C. Chato, PhD '60, sends word: "Last year I received the Lissner Award from the Bioengineering Division of the ASME and was elected to its Executive Committee." ... Richard L. Schapker, SM '57 (XVI), ME '64, reports: "Since 1991, I have been manager of mechanical engineering at EG&G Optoelectronics/Judson in Montgomeryville, Pa."

Steven Spear, SM '93 (II, XV), sends e-mail: "Greetings from Japan. All is well here. I am a visiting researcher at the University of Tokyo, participating in a MITI proposed international consortium to develop advanced manufacturing technologies. I just returned from Kyushu, where I gave a talk at the Kyushu Institute of Technology, and from Kyoto, where our consortium was having a week-long meeting with Japanese, American, and European partners. The Sloan '91 group stays in pretty close contact with each other, and schedules a once-a-month get-together. Fortunately, our meeting place has been able to accommodate a growing crowd of new arrivals and new spouses." ... Miklos Sajben, ScD '64, has been named the Ohio Eminent Scholar and Professor of Aerospace Engineering and Engineering Mechanics at the University of Cincinnati's College of Engineering. ... Dartmouth College has selected two faculty members to named professorships. David Lynch, '72, SM '72, has been named as the first holder of the MacLean Professorship in the Thayer School of Engineering at Dartmouth College. Lynch, who has been at Thayer for 15 years, anticipates that his future research may explore global management of industrialization. He is currently working to simulate ocean movement with computers. Graham B. Wallis, SM '59, has been named the Sherman Fairfield Professor in Engineering. Wallis has been a member of the Thayer School faculty since 1962 and, until

### DEGREE CODES

AE	Aeronautical Engineer
BE	Building Engineer
CE	Civil Engineer
CHE	Chemical Engineer
CSE	Computer Science Engineer
DPH	Doctor of Public Health
EAA	Aeronautical & Astronautical Engineer
EE	Electrical Engineer

EGD	Doctor of Engineering
ENE	Environmental Engineer
MAA	Master in Architecture Advanced Studies
MAE	Materials Engineer
MAR	Master in Architecture
MCP	Master in City Planning
ME	Mechanical Engineer
MET	Meteorologist
MIE	Mineral Engineer

MME	Marine Mechanical Engineer
MNG	Master in Engineering
MPH	Master in Public Health
MTE	Metallurgical Engineer
NA	Naval Architect
NE	Naval Engineer
NUE	Nuclear Engineer
OCE	Ocean Engineer
PhD	Doctor in Philosophy



last July, served as associate dean. An expert on fluid mechanics, his research at Darmouth has involved the study of two-phase flow, which makes up about half of all industrial, biological, and environmental mechanics.

Coast Guard Lieutenant Commander Mark R. Steinhilber, SM '87 (II, XIII), recently received the Coast Guard Achievement Medal. Steinhilber was cited for superior performance of duty while serving at the Marine Safety Office in San Francisco. During Operation Desert Shield, he directed the inspections of reserve merchant vessels that were reactivated for service in the Middle East. . . . **John McCarty**, '58, director of NASA's Propulsion Laboratory, was awarded the Presidential Rank of Meritorious Executive. Each year the rank is bestowed on a small number of career Senior Executive Service members whose career achievements are exceptional. McCarty is a propulsion engineer whose experience ranges from development of advanced propulsion concepts to certification of flight-ready systems. He directs the work of over 250 engineers, scientists, and technicians dedicated to analysis and design of new propulsion systems and operates unique research and test facilities that provide experimental data from ground testing of launch vehicles and liquid and solid rocket engines.



**K. Subbramanian**

**K. (Subbu) Subbramanian**, SM '77, ME '77, ScD '78, has been chosen as one of eight members of the Society of Manufacturing Engineers (SME) to be inducted into the 1993 College of Fellows. "Chosen for his leadership in cutting tool development, grinding technologies, and research management, Subbramanian

is known world-wide in materials processing development and application. For Norton Co., where he is currently director of product testing and applications development, he has developed truing and dressing devices that are now being used throughout the United States, Japan, and Europe. He has also helped in the development of grinding technology related to CBN and electronic ceramics grinding. Another major accomplishment was the establishment of the Ceramic Machining Technology Center at Norton, the brainchild of Subbramanian. The Center works toward achieving technology-based marketing and long-term partnerships with key customers and machine tool builders," states an SME press release. . . . **Elizabeth Altman**, SM '92 (II, XV), manufacturing engineer with Motorola in Boynton Beach, Fla., is one of 30 U.S. engineers chosen to spend a year working in Japan to gain hands-on experience with Japanese manufacturing practices. The engineers are part of a first-ever technology transfer program known as the U.S.-Japan Manufacturing Technology Fellowship Program. Altman left in early January and is spending a year working with the Japanese host company Sony Corp.

**Marcus G. Comuntzis**, SM '50, of Pittsburgh, Pa., died on August 17, 1989. Comuntzis worked for many years at the Jet Propulsion Lab in Pasadena, Calif. . . . The

Association of Alumni and Alumnae has been notified that Colonel **John W. Hansborough**, SM '35 (ret.), of Austin, Tex., died on July 30, 1993. No further information was provided.

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## MATERIALS SCIENCE AND ENGINEERING

**Jeff Dieffenbach**, SM '89 (III, TPP), sends word from Wellesley, Mass.: "My wife, Jennifer, and I have a new baby—Taylor Aaron Dieffenbach, born September 24, 1993. I am project manager at IBIS Associates, a business development consulting firm. I am also the business manager for my wife's architecture business." . . . From Cherry Hill, N.J., **Steven J. Berman**, SM '73, reports: "Having left the Hay Group where I was director of the Workforce Variable Compensation Practice for North and South Americas, I have assumed a larger-scope position as national practice director of the Alternative Rewards Practice for KPMG Peat Marwick, the world's largest accounting and management consulting firm." . . . **Ray K. Robinson**, ScD '73, writes: "RKRI (Ray K. Robinson, Inc.) is having a good year after an unsuccessful attempt to raise a 'first-time' \$50 million venture fund in '91-'92. This regional management constructing firm is focusing on technology commercialization, information systems and networks, and economic development—most related to the huge environmental clean-up activity underway at the Department of Energy's Hanford site in Washington State. I am president of the Blue Mountain Council of the Boy Scouts of America (Oregon/Washington); on the board of the largest regional economic development council, a National Church Foundation board member and investment manager/chair; and the 1991 U.S. 'Energy Expert' and city 'Outstanding Professional.'"

The Association of Alumni and Alumnae has been notified that **Stanley Y. Ogawa**, SM '60, of San Jose, Calif., died on September 24, 1993. No further information was provided.

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## ARCHITECTURE

**Russ V.V. Bradley**, MAR '71, sends word from Switzerland: "I am still practicing international law in Geneva with my Swiss lawyer wife, Catherine. Daughter, Julia is now 4.5 and son, Alexander, was 3 at Christmas. Architecture remains a love but now it is the study of old European architecture for fun and not the design of new American buildings." . . . From Chevy Chase, Md., **John Viale**, MCP '64, writes: "After spending a couple of years detailed to the Senate Permanent Subcommittee on Investigations, I'm back at the U.S. General Accounting Office—the congressional audit/investigation agency. Currently, I'm studying the Federal Deposit Insurance Corp.'s asset management activities, and the prospective consolidation of the Resolution Trust Corp. with FDIC. I get a lot of amusement out of playing with computers at work and home.

My wife, Joyce, has just been asked to testify on immigration issues by the House Ways and Means Committee—she's with the Library of Congress. My daughter, Jill, is 29 and the director/founder of the Museum of Children's Art (MOCHA) in Oakland, Calif. Regards to all of my classmates. I can be reached at VIALET@delphi.com using e-mail." . . .

**William A. Bartovics**, SM '84, writes from Lincoln, Mass.: "I am director of utility programs-demand side management in public housing at Citizen's Conservation Corp. in Boston. I am working with Boston Edison, Commonwealth Gas & Electric, etc., in Mass., and PG&E in California. I'm also working in Texas, Illinois, and New Jersey—mostly in elderly housing doing lighting retrofits and energy management system installations. In the process, we're improving conditions and savings."

**Gerald W. Billes**, MAR '72, MAA '72, sends word from New Orleans, where he is principal at Billes/Manning Architects, "Our new projects include: Aquarium of Americas (phase II), Ernest N. Morial New Orleans Convention Center (phase III), New Orleans Center for Creative Arts, and House of Blues, a jazz club and restaurant." . . . **Jean C. McCarthy Marshall**, MCP '61 is town planner for the towns of Southwest Harbor and Tremont on Mount Desert Island in Maine. . . . **William S. Rask**, MAR '85, is living in San Francisco and is a principal architect at San Jose Redevelopment Agency. . . . **Stephen Kendall**, PhD '90, sends word: "Recognizing the importance of revaluing buildings as a dominant activity for the design professions, I joined the faculty of interior design at Marymount University in Arlington, Va. I continue publishing and speaking on open building in housing (PA, November 1990) and open systems in the building industry." . . . From Great Barrington, Mass., **Ann R. Marion**, SM '82, writes: "I relocated to the Massachusetts Berkshires and am currently producing a CD-ROM 'expanded book' of Marvin Minsky's *Society of the Mind*." . . . **Joseph Burns**, SM '84 (I & IV), reports: "I am director of LeMessurier Consultants' Chicago office, providing structural engineering services on projects in the Midwest. I was an adjunct professor at the University of Illinois at Chicago the past several years, teaching structures courses and design studio in the Architecture Department. I recently joined the faculty of ArchiWORKS, Chicago's new school of architecture, set to open September 1994. Watch for posters and send for our program prospectus."

Addison-Wesley Publishing Co. has released *Multimedia Computing: Case Studies from MIT Project Athena* (1993), by **Russell M. Sasnett**, SM '86, and **Matt Hodges**. The book is divided into thirds. "Part I provides an overview of multimedia, covering its evolution and the major conceptual issues in the design of multimedia systems. Topics include aesthetics, information design, systems of representation, and advances in technology. Part II surveys the multimedia applications developed at MIT Project Athena. Examples have been chosen that cover all major applications. Part III provides a survey of the major technical issues involved in producing multimedia systems, including timing and synchronization and document architecture," states the book jacket. Sasnett, formerly a visiting scientist at MIT from GTE Labs, is currently a senior member of the technical staff at GTE, investigating



# CourseNews

new technologies for constructing broadband multimedia information services. Hodges, who spent time as a visiting scientist at MIT while at DEC, is a coauthor of the Athena MUSE language, which was developed at MIT.

**Tobias R. Hanks**, MAR '71, of Newton, Mass., died on October 31, 1993. He worked for Benjamin Thompson & Associates in Cambridge and was a project manager for Harvard Community Health Plan. At the time of his death, Hanks was employed by Steffian Bradley Associates, Inc., in Boston. Hanks had a life-long love for the violin, spending many summers at the Kinhaven Music School in Weston, Vt. He played with various amateur orchestras in the Boston area and regularly hosted friends in his home to play quartets.

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## V CHEMISTRY

From Newark, Del., **Louis A. Kaminski**, PhD '59, writes: "I retired last year from the DuPont Co. after 30 years in research, marketing, and technical administration. My last years at DuPont were devoted to the recruitment of scientists at the PhD and PD levels. This allowed me to visit MIT on a



**Joanne Schwark**

regular basis to recruit in the Chemistry Department." **Joanne Schwark**, PhD '87, has been appointed senior research chemist for the Textiles, Paper & Leather Industries Group at Wacker Silicones Corp. in Adrian, Mich. Schwark is responsible for Wacker's silicone rubber coating technology in the industrial fabric market. Her background includes R&D in silicon-based preceramic polymers and silicon-carbon resins for microelectronic applications. She holds eight U.S. patents and has six publications in polysilazane chemistry. Before joining Wacker, Schwark did research work for Hercules, Inc., in Wilmington, Del. . . . **Karen Root Caldwell**, PhD '83, reports: "Completed term as a postdoctoral research associate at Binghamton University (Binghamton, N.Y.) in 1990. Work resulted in a chapter entitled 'Active Sites in Soluble Ziegler Polymerization Catalysts Generated from Titanocene Halides and Organo-aluminum Acids,' cowritten with John J. Eisch, in the book *Homogeneous Transition Metal Catalyzed Reactions* (American Chemical Society Symposium Series 230, 1992)." . . . From Wynnwood, Pa., **George A. Frank**, PhD '65, writes: "I just finished serving a one-year term as president of the Philadelphia Patent Law Association. I was elected chair of bioscience law of the Intellectual Property Law Section of the American Bar Association." . . . **John T. Viola**, PhD '67, sends word from Westlake Village, Calif.: "Greetings to all

from Southern California as we survived the recent fire storms here. Now it rains and threatens bare hillsides with mud slides. Nevertheless, life is pleasant here." . . . **Dominic M. Desiderio**, SM '64, PhD '66, professor at the University of Tennessee, has been invited by John Wiley and Sons publishers in New York, to be co-editor of the journal *Mass Spectrometry Reviews*. . . . **Paul H.L. Walter**, '56, professor of chemistry at Skidmore College in Saratoga Springs, N.Y., has been re-elected as chair of the ACS's board of directors. Walter began this one-year term in January. Last November he was re-elected as director-at-large on the 16-member board for 1994-96.

The Association of Alumni and Alumnae has been notified that **Clarence K. Morehouse**, PhD '47, of Longwood, Fla., died on September 25, 1993. No further information was provided.

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## VI ELECTRICAL ENGINEERING AND COMPUTER SCIENCE

**Frederick Q. Gemmill**, SM '39, writes: "I've been retired from employment 11 years now, and 2 years from town official duties. I'm enjoying my hobbies hiking in the Colorado Rockies and land surveying in New Hampshire." . . . **Charles Campling**, SM '48, sends word that a colleague of his, **Bill Gilbert**, SM '35 (II), has been honoured at the centennial convocation of the Faculty of Applied Science at Queen's University in Kingston, Ontario. Gilbert was conferred with an honorary doctor of science. Campling writes: "At this stage of our lives we're both professors emeriti at Queens—which, like one or two other Canadian universities, likes to think of itself as a Harvard of the North." . . . From Brookline, Mass., **Brian R. Harris**, SM '90 (VI, XV), reports: "I joined Oracle Consulting's new business process reengineering practice to launch the practice in the New England region. It's very exciting!" . . . **Reza Ghanbari**, PhD '93, writes: "I am currently working at the Mayo Foundation in Rochester, Minn., developing a new biomedical imaging laboratory with an emphasis on confocal microscopy and atomic force microscopy." . . . **James A. Roberts**, SM '68, is professor and chair of the Electrical Engineering and Computer Science Department at the University of Kansas at Lawrence. . . . **Thomas J. Lynch**, SM '59, is co-chair of an AIAA standards committee for the development of a standard for space-based data compression. . . . . **Joseph Cherian**, '86, has been named an assistant professor of finance at Boston University's School of Management. Cherian is a specialist in capital markets, as well as market efficiency and regulatory issues associated with market manipulations. Prior to joining Boston University, he was a lecturer at Cornell University's Johnson Graduate School of Management. From 1986-89, he served as a staff project engineer and member of the executive committee for Goodyear International in Malaysia. . . . **James H. Ahlgren**, '55, an associate professor of medicine and pharmacology at George Washington University of Medicine, has been chosen to receive the 11th annual Dr. Jonathan M. Wainwright Award of Moses Taylor Hospital. Ahlgren is chair of the Mid-Atlantic Oncology Program, staff physician at

The George Washington University Hospital, and associate director of The George Washington University Cancer Center, all in Washington, D.C. He has been awarded research grants totaling more than \$2 million.



**Susan Hall**

**Susan A. Hall**, SM '82, PhD '92, has been named a visiting assistant professor of management at Babson College in Wellesley. She taught decisions support systems in Babson's evening MBA program, and is currently teaching operations management in the undergraduate program. Queue management in the service

sector is her primary area of research. Hall was a consultant with Queues Enforth Development Corp., a technology consulting company in Cambridge, and was a systems engineer for satellite communications systems and data systems at RCA Astro-Electronics in Hightstown, N.J.

The Association of Alumni and Alumnae has been notified of the following deaths: **Commander Howard Howlett Montgomery, Jr.**, SM '47, of Annapolis, Md., on June 16, 1992, and **Samuel Lieben**, SM '33, of Fort Lee, N.J., on January 27, 1993. No further information was provided.

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## VI-A INTERNSHIP PROGRAM

In the January '94 issue I mentioned the interim leadership of the VI-A Program. I am happy to report at this writing that a new VI-A director has been chosen to take over in June 1994. He is Professor **Markus Zahn**, '67, SM '68, EE '69, ScD '70, of the EECS Department faculty.

Zahn, a VI-A grad, had his assignments at the Raytheon Co.'s Equipment Division in Wayland, Mass. In May 1989, he was the recipient of one of the Graduate Student Council's Teaching Awards. In March 1993, he was made a Fellow of the IEEE.

Following a 10-year stint on the faculty of the University of Florida at Gainesville, Markus began his employment with our EECS faculty in 1980. From June '92-June '93, he was on sabbatical in France at the Centre National de la Recherche Scientifique, Laboratoire. At MIT, he is affiliated with LEES (Laboratory for Electromagnetic & Electronic Systems). Zahn will be working with the current VI-A management in order to provide for a smooth transition in its leadership.

Professor Reintjes reports that he met **James O. McDonough**, '43, SM '47, who wished him to say "hello" to all VI-Aers. Jim was a project leader in MIT's Servomechanisms Lab, or which Reintjes directed.

Information from visitors and callers to the VI-A office since last writing include a call from **Steven L. Bates**, '74, SM '76, EE '76, who says things are going well with the new company of which he is president, Synchronons Network Solutions of Burlington, Mass. . . . A pleasant chat with **Arthur C. M. Chen**, '61, SM '62, PhD '66, manager of the Information Systems Laboratory at G.E. in Schenectady, N.Y. . . . A visit from **Dan E. Dudgeon**, '69, SM '70, EE '71,



Institute Professor Emeritus Bruno B. Rossi died November 21 at his home in Cambridge at the age of 88 of cardiac arrest. He had not been well for several years. Professor Claude Canizares, director of MIT's Center for Space Research, described Rossi as "one of the giants of modern physics and astrophysics."

In the 1930s, Rossi's experimental investigations of cosmic rays and their interactions with matter helped lay the foundation for high-energy particle physics. Cosmic rays are atomic particles that enter earth's atmosphere from outer space at speeds approaching that of light, bombarding atmospheric atoms to produce mesons as well as secondary particles possessing some of the original energy.

Prior to his arrival at MIT, Rossi invented many of the basic experimental techniques that are still in use in every major laboratory, Canizares said. At MIT, Rossi's cosmic-ray work continued, but much of his energy was devoted to opening new windows on the universe.

"He is rightfully called the grandfather of high-energy astrophysics, being largely responsible for starting X-ray astronomy, as well as the study of interplanetary plasma. Each of these is now a rich and exciting enterprise. His textbooks, models of clarity, have been used by generations of physics students," Canizares continued. "Not least, he was a model of scientific integrity and personal warmth who touched deeply all those privileged to work with and know him. He will be sorely missed."

Bruno Benedetto Rossi was born in Venice, Italy, in 1905. He studied at the

1905-1993  
BRUNO ROSSI

## THE GRANDFATHER OF HIGH ENERGY ASTROPHYSICS



University of Padova and later at the University of Bologna, from which he received the degree of Doctor of Physics in 1927. Four years later he became a professor of physics at the University of Padova, a position he held until he was dismissed by the Fascists. He left Italy in 1938.

After a period in Denmark and England, Rossi came to the United States in 1939 to work as a research associate at the University of Chicago. The following year he was appointed an associate professor of physics at Cornell. In 1943, he

joined the staff of the Los Alamos laboratory, where he made major contributions to the development of the atom bomb. He was appointed a professor of physics at MIT in 1946 and became an Institute Professor, a rank reserved for scholars of special distinction, in 1966. He retired in 1970.

Rossi began working on cosmic rays in 1929 when only a few scientists were interested in the subject. In that year he invented the first electronic circuit for recording the simultaneous occurrence of three or more electrical pulses. This circuit, widely known as the "Rossi coincidence circuit," proved not only to be one of the fundamental electronic devices for experimental high energy nuclear physics, but also to be a basic element of modern computers.

In 1958 Rossi focused attention on the potential value of direct measurements by space probes of the ionized interplanetary gas. He and his collaborators developed a new detector for such measurements, and in an experiment conducted aboard the "Explorer X" satellite in 1961, they discovered the magnetopause, the boundary of the region of space dominated by the earth's far magnetic field.

In 1960 Rossi initiated an exploratory search for cosmic X rays. This led to the discovery in 1962 of the great Scorpio X-ray source, the first nonsolar source of cosmic X rays to be observed.

Rossi's autobiography, *Moments in the Life of a Scientist* was published by the Cambridge University Press in 1990. A scholarship fund in his memory is being established in the Department of Physics. ■

ScD '74, with MIT's Lincoln Laboratory. Dungeon was made a Fellow of the IEEE in 1987. . . A visit from Stephen P. Emecott, '89, SM '90, who's with Motorola/Schaumburg in Illinois. . . I had a chance meeting outside the Grier Room (36-401) with Steven G. Finn, '68, SM '69, EE '70, ScD '75 (he was talking with David H. Staefin, '60, SM '61, ScD '65, Course VI professor and assistant director of Lincoln Lab). Steven is a visiting scientist at LIDS (Laboratory for Information & Decision Systems) here at MIT. . . I had a visit from Robert P. Gilmore, '77, SM '77, VP of Qualcomm, Inc., in San Diego, who was here visiting the Industrial Liaison staff and whose company will join VI-A this coming year. One of Qualcomm's founders is Andrew J. Viterbi, '56, SM '57. . . I received an informative letter from Marion B. Reine, our VI-A coordinator at Loral Infrared & Imaging Systems in Lexington, Mass., who tells of a paper delivered by José L. Meléndez, '90, SM '91, at a workshop in Seattle, and another by

Stephen P. Tobin, '78, SM '79, at the same meeting, which were excellent papers reflecting well on their VI-A training. José's VI-A company supervisor at Texas Instruments was Jeffrey D. Beck, '71, SM '72, who had done his VI-A work at Honeywell Radiation Center (now Loral) as did Steve Tobin. Small world! We appreciate Marion's note on our graduates' continued good work.—John A. Tucker, director (emeritus), VI-A Internship Program, MIT, Room 38-473, Cambridge, MA 02139.

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## VII BIOLOGY

James G. Rheinwald, PhD '76, writes: "I have accepted a position as associate professor at Harvard Medical School and Brigham and Women's

Hospital, in their recently expanded Division of Dermatology with Tom Kupper as chair. This is a full-time position back in academic research, similar to that which I had at the Dana-Farber Cancer Institute, just a few blocks from here, from 1978-90, although I will retain a consulting relationship with BioSurface Technology as the chair of its Medical and Scientific Advisory Board." . . . Stephen Elledge, PhD '83, was part of a team that wrote a paper published in the journal *Cell* on how the protein p53, when damaged or missing, allows some cancers to form. He and his coauthor, Wade Harper, are at the Verna and Marrs McLean Department of Biochemistry at Houston's Baylor College of Medicine. Elledge is also an assistant investigator in Baylor's Howard Hughes Medical Institute. Elledge's paper is one of three published papers based on research at three research institutions doing similar research.

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# VIII PHYSICS

From Pacific Palisades, Calif., John D. Mallett, SM '47, writes: "I am working at Adaptive Sensors, Inc., in Santa Monica. The Malibu fire was stopped about five miles from here by the most enormous collection of firefighters and water-dropping planes." . . . Peter A. Cole, ScD '38, from Falls Church, Va., sends us a list of his activities: "From 1938-42, I was doing laboratory research in biophysics at the National Institutes of Health. While there I set up the first ultraviolet microscope in the United States. Other activities include: 1942-45 Radiation Lab at MIT; 1948-64, operations research for the U.S. Air Force and Analytical Services, Inc.; 1964-70, optical systems in the Radiation Division at Sanders, Inc.; 1970-90, Electronic Counter-Measures, in Washington, D.C.; 1990-present, retired, interests are in biophysics, nuclear power generation, and high-

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energy particles." . . . Zbigniew M. Drozdowicz, PhD '78, writes: "I am delighted by the birth of daughter #3, Zoe Anne, as well as promotion to the position of VP for R&D at Oriol Corp., in Stratford, Conn." . . . Stephen B Wong, PhD '89, who last year served as a lecturer at California Lutheran University in Thousand Oaks, Calif., has been appointed assistant professor in the Math-Physics-Computer Science Department.

Herbert B. Callen, PhD '47, of Sarasota, Fla., died on May 22, 1993. He was an emeritus professor of physics and former chair of the faculty senate at the University of Pennsylvania. Eleven years ago he took an early retirement after his diagnosis of Alzheimer's disease. Callen was a distinguished theoretical physicist whose fluctuation dissipation theorem helped explain how electricity flows. A Guggenheim Fellow and Fellow of the NAS, he received the Elliot Cresson Medal of the Franklin Institute in 1984 in recognition of lifelong contributions including work on the Manhattan Project during WWII. Callen was national chair of the American Professors for Peace in the Middle East and a visiting professor at Hebrew University, the Weizmann Institute, and the University of Recife in Brazil. . . . The Association of Alumni and Alumnae has been notified that Henry A. Morss, Jr., PhD '34, of Hardwick, Mass., died on November 17, 1993. No further information was provided.

## IX

### BRAIN AND COGNITIVE SCIENCES



Larry Squire

Larry Squire, PhD '69, received a 1993 Charles A. Dana Foundation Award for Pioneering Achievement in Health. Squire is a professor at the University of California at San Diego in the Department of Psychiatry. . . . Robert Stone, '37, has published *The Jesus Legacy* (Sum Press, 1993). The book

jacket states: "An exciting probe into the scientific findings of José Silva, which are unmistakably connected by incidents and 'coincidence' to the spiritual teachings of Jesus; and how they can be used by everybody to attain anything they want out of life."

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## X

### CHEMICAL ENGINEERING

Yihhong Song, ScD '78, sends word from Solon, Ohio: "I have been promoted to the senior VP of R.F. Webb Corp. I am responsible for the development of alternative transportation fuels and alternative fuel vehicles in North America and the Far East."

From Summit, N.J., Jacek Jedruch, SM '58, reports: "I am now the senior principal engineer at Ebasco Services, Inc. We are

located at 2 World Trade Center, which means that we had to live through the bombing, evacuation, and the temporary relocation to New Jersey until the damage was repaired."

Arthur S. Merrow, Jr., SM '39, of Hamburg, N.Y., died on July 30, 1993. A fuel engineer, Merrow retired in 1976 as superintendent of fuel and utilities at Bethlehem Steel's Lackawanna complex. He was also an active official in the United Methodist Church, holding several offices and attending conferences. Merrow was active in the Association of Iron and Steel Engineers, chair of the Environmental Activity Council of the Buffalo Area Chamber of Commerce, and a member of the Erie-Niagara Basin Regional Water Resources Advisory Committee of the state Department of Environmental Conservation.

The Association of Alumni and Alumnae has been notified of the following deaths: George L. Ahrens, SM '35, of South Londonderry, Vt., on January 2, 1993, and Ross W. Rotzler, SM '41, of Marshall, Tex., on August 11, 1993. No further information was provided.

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### X-A PRACTICE SCHOOL

From Baton Rouge, Adrian E. Johnson, Jr., SM '49, writes enthusiastically about his third career, starting in 1989 even before his second career officially ended. Johnson now spends about nine months a year in full-time consulting in chemical process simulation, optimization, and control for two clients—a major chemical company and an entrepreneurial computer control contractor; of the nine months, two or three are spent in international travel. The other three months of the year are Johnson's, used mostly for pleasure travel with his wife and sometimes grandchildren. Johnson's first career, beginning when he left MIT, was in industry—Mobil, IBM, and Union Carbide. In 1968 he joined the Chemical Engineering Department at Louisiana State University where he taught for 24 years before retiring in 1992. Says Johnson thankfully (he wrote us during the week of Thanksgiving Day), "I'm enjoying the fruits of my excellent educational experience at the University of Florida, MIT, and LSU and in 20 years in industry."



Sanjay Chhabria

Andersen Consulting, a division of Arthur Andersen & Co., has announced the appointment of Sanjay P. Chhabria, SM '86, as manager of its Columbus, Ohio, office. Chhabria is in Andersen's Technology Integration Services Group, a specialist in client/server and object-oriented technology. He entered MIT from

the Indian Institute of Technology and joined Andersen Consulting in 1988.

Carol Phillips at the SCEP office received a long, chatty letter from Tina Srivastava, '92, SM '93, who went to work last July as a process engineer for Exxon in Singapore. The



excitement has not yet worn off: "The entire plant consists of only about 120 people, of which only 6 or 7, including 2 of the 5 process engineers, are women....I really like the smallness of the plant. I'm getting to know a lot of people, from the technicians to the managers. The engineers here get to dabble in a wide range of duties (boring and not so boring). From what I've heard it's a good place for new engineers to gain a lot of experience....I sometimes have confidence crises about whether I'll be able to do my job and live up to expectations; I just hope nothing in the plant goes 'BANG!' because of me." Finding it hard to make new friends, Srivastava has joined the MIT Club of Singapore ("see how desperate I am," she writes Phillips), and she daydreams about returning to the USA—and about visits from classmates to her "sunny, tropical island to escape the dreary, bone-chilling Northeast winter." (It was a sunny 80° F when she wrote on November 24.) ... Also from Phillips, reporting a surprise visit in December from **Sudhakar Puvvada**, SM '89, ScD '92: Puvvada is research associate at the Naval Research Laboratory in Washington and lives with his wife Veena in Fairfax, Va. He doesn't consider the NRL a "real job" and is still hoping to find one in production or manufacturing; he was in Boston for a Materials Research Society conference.

Three deaths to report this issue: **Edwin H. McCormick**, SM '32, on November 10 in Roswell, Ga., at age 86; **Perley A. Coffin**, SM '33, on November 3 in Gloucester, Mass., at age 84; and **David E. Reid, Jr.**, SM '38, on July 30 in Warwick, R.I., at age 78.

**McCormick**, who lived in Jekyll Island, Ga., where he was managing director of the Jekyll Island Waste Water Authority, died in Hartford, Conn., while visiting his son. He lived two careers: in one he was a long-time president of the McCormick Tractor Co. and then of the S.R. Gerber Sausage Co. in Buffalo, N.Y.; in the other he was a professional violinist who once appeared with the piano virtuoso Rachmaninoff in Carnegie Hall and recently conducted his own classical radio program for an FM station in Brunswick, Ga.

A long-time resident of Gloucester and native of Newburyport, **Coffin** was a chemical engineer with General Latex and Chemical Corp., Cambridge, for 45 years. He entered MIT from Northeastern University.

**Reid** had a many-sided career in the chemical/petroleum industry: from 1938–43, senior service engineer for Foster Wheeler, New York; from 1943–45, assistant engineer, Project Analysis Division, Monsanto, assigned to the Manhattan Project at Columbia University; from 1945–48, design engineer, Texas Co., New York; from 1948–52, assistant technical director, Continental Oil, Ponca City, Okla.; from 1952–56, project engineer, Barrett Division, Allied Chemical and Dye, Philadelphia; 1956–61, assistant technical director, American Cyanamid, New York; and 1961–79, senior engineer, Mobil, New York. For Mobil he designed and operated an important LPG recovery plant in Venezuela and wrote a manual for catalytic cracking plants licensed by the company. In retirement Reid lived in Jacksonville, Fla., from 1980–85, and then moved to Rhode Island.—**John Mattill**, *Technology Review*, MIT, W59-200, Cambridge MA 02139.

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## XI URBAN STUDIES AND PLANNING

**Edward H. Kaplan**, SM '79, MCP '79, SM '82 (XVIII), PhD '84, writes: "I was promoted to professor of management sciences and medicine at Yale (with tenure). Visiting Hebrew University in Jerusalem in Spring '94, as Lady Davis Professor at medical school to work on AIDS policy." ... From Princeton University, **Clinton J. Andrews**, SM '85 (TPP), PhD '90, reports: "Research is going well. I was just named an AT&T Industrial Ecology Fellow, plus the TVA is sponsoring a major experiment with communicative electricity planning. Teaching also has its joys. Frank Von Hippel, '59 (VIII), and I convinced the faculty to launch a Science, Technology & Public Policy track at the Woodrow Wilson School; we had our first half-dozen graduates last June." ... **Dora P. Currea**, PhD '91, sends word: "I am a development economist with Interamerican Development Bank. My job involves considerable travel to Jamaica, Trinidad, and Costa Rica." ... Word from **Kristin L. Dawkins**, MCP '91: "I am director of research for the Institute for Agriculture and Trade Policy, with expertise on the environmental impacts of trade policy. I published numerous articles and toured the nation speaking on the problems of NAFTA, alternative strategies for international development policy, and trends in global institutions." ... From San Jose, Calif., **Peter Coe Verbica**, SM '92, fills us in on his activities last year: "Co-founder of Heritage Bank of Commerce; provided venture capital funding for Andor, a Gene Amdahl company; founded Blue Lakes Ranch, Inc., and registered 200,000 shares of stock (with the State of California commissioner) for sale to the general public; board of trustees, San Jose Repertory Theatre, De Saisset Museum, and KTEH-TV Channel 54; CEO of the Coe Corp.; and a trustee of various private trusts."

From Brooklyn, N.Y., **Alex E. Friedlander**, SM '65 (I), PhD '69, writes: "This year I became senior director of schedules at the NYC Transit Authority. I am responsible for all bus and subway schedules, and work schedules for train crews and bus operators. I have also developed a second career in my spare time as a genealogist and am a nationally recognized expert in Jewish genealogical research. Son, David, is a junior at Vassar College; daughter, Paula, is a senior at Hunter College High School. I've been married for 24 years to Eija Malkki of Savonlinna, Finland." ... **Lynn A. Monaco**, MCP '77, lives in Honeoye Falls, N.Y. She is a partner in the Environmental Practice Group at Nixon, Hargrave, Devans & Doyle, in Rochester, N.Y. ... **Nancy B. Kitsos**, MCP '83, announces her new name. She was Nancy J. Baldwin prior to getting married. She lives in Los Angeles and works as an environmental specialist at the Northrop Corp. in Hawthorne, Calif. ... **Sheryl L. Handler**, PhD '85, who was both chair and CEO at Thinking Machines Corp., is now chair of the Cambridge-based firm. ... **Paula R. Collins**, MCP '75, principal at Western Development Group in San Bruno, Calif., has been named to the board of directors of Bay View Capital Corp. in San Mateo, Calif.

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# CourseNews

## XII EARTH, ATMOSPHERIC AND PLANETARY SCIENCES

From Carmel, Calif., **Glyn Lynde**, SM '52, writes: "I retired from the U.S. Air Force and then was employed by Traveler's Research Center, Litton, and BDM. I'm now fully retired." ... **Francis E. Courtney, Jr.**, SM '52, reports: "I am completing my 50th year of professional meteorology work in 1994!" ...



**Bill Durham**

**Bill B. Durham**, PhD '75, an experimental geophysicist in earth sciences at the Lawrence Livermore National Laboratory in California, is the winner of the Alexander von Humboldt Foundation Senior U.S. Scientist Award for a year's study in Germany. A lab scientist since 1977, Durham previously had won a von

Humboldt fellowship for young scientists eight years ago in which he studied solid-state thermodynamics with a top materials scientist. Scientists cannot apply for the senior award and must be nominated by their German hosts. The award is given annually to fewer than 80 U.S. scientists. He plans to begin a 12-month research leave at the University of Bayreuth in Bavaria next summer, this time to study deformation of the mantle's main component, olivine, at the extreme pressures that exist in the earth's interior. This mineral was the subject of his doctoral thesis, but his work at Livermore has generally involved other materials. Most recently he has focused on the deformation of ice under the conditions that exist on the moons of Saturn and Jupiter. In Germany he will submit olivine to pressures up to 130,000 times atmospheric pressure to test its mechanical properties, which has implications for continental drift and the convective flow of minerals in the mantle.

The Association of Alumni and Alumnae has been notified that **William B. Farrington**, PhD '53, of Laguna Beach, Calif., died on July 17, 1993. No further information was provided.

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## XIII OCEAN ENGINEERING

**Jennifer Jean Zeien**, SM '80, writes from Arlington, Va.: "I joined the Washington, D.C., law firm of Fort & Schlefer in September 1993. The firm's practice emphasizes maritime law. I joined as an associate attorney." ... **Captain Daniel Hunt**, SM '48 (USN, ret.), reports: "Shirley and I are now permanently residing in our restored home in Chestertown,



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Edmund A.C. Crouch, PhD  
Timothy L. Lash, '87, MPH  
Stephen G. Zemba, SM '85, PhD '89  
Sarah Armstrong, MS  
Dena Jaffe, MS  
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Md. It was built by Captain Nicholson in 1788."

From Cupertino, Calif., **Graham Skinner**, SM '82 (II, XIII), writes: "I have enjoyed my 10 years of work for Lockheed's Marine Systems Department in Sunnyvale, Calif. Patricia and I have adopted two delightful children—Mollie (now age 4) and Colton (now age 1)."

**Reuven Leopold**, '61, SM '63, ME '65, PhD '77, has been elected a Fellow by the British Royal Academy of Engineering. He is the only American so honored in 1993. He was cited for "his achievements in the field of U.S. Navy ship designs, particularly his innovations in hull design and hydrodynamics. He is responsible for the design of more than half of the ships in the U.S. Navy today."

The Coast Guard sends press releases on two MIT alums: Coast Guard Lieutenant Commander **Mark R. Steinhilber**, SM '87 (II, XIII), recently received the Coast Guard Achievement Medal. Steinhilber was cited for superior performance of duty while serving at the Marine Safety Office in San Francisco. During Operation Desert Shield, he directed the inspections of reserve merchant vessels that were reactivated for service in the Middle East. Coast Guard Lieutenant Commander **Darrell E. Milburn**, OCE '89, recently received the Coast Guard Commendation Medal. Milburn was cited for "meritorious service while serving as a project officer at USCG R&D Center, Groton, Conn.," where he is currently assigned. According to the Coast Guard press release, "there he achieved world-wide recognition as one of the foremost international authorities concerning motor life boats. Through his scientific research, he improved the operation and the dynamic stability of the Coast Guard's new 47-foot motor life boats, made operational improvements to ships and boats which supported search-and-rescue missions, and invented tools which aided buoy-tender crews. He also wrote three significant articles which were published in international journals of naval architecture."

Navy Lieutenant **Dennis M. Wojcik**, SM '93, recently reported for duty aboard the aircraft carrier *USS Independence*, forward deployed to Yokosuka, Japan.

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## XIV ECONOMICS

**Ralph H. Bergmann**, PhD '50, writes: "After retirement in June 1992 from California State University at Fresno, I was named professor emeritus and I continue in contact with the university and my former colleagues. I've traveled for several months since retirement: Turkey and Israel in the fall of 1992; National Parks in California, Utah, and Arizona in spring of 1993; New England and Quebec in summer 1993; London and Morocco in fall 1993; and Whitehorse (Yukon Territory) in winter 1993. Truly enjoying retirement—reading, traveling, visiting children, and lazing." ... From Ottawa, Canada, **A.J. MacEachen**, '53, writes: "I was awarded the Grand Cross

of the Order of Merit by the president of the Federal Republic of Germany in a ceremony held in Freiberg, Saxony, on October 5, 1993. It was awarded in recognition of contribution in furtherance of international understanding. The ceremony was presided over by Kurt Biedenkopf, minister president of Saxony." ... **Charles J. Stokes**, '51, reports: "I am now at Andrews University in Michigan. I retired from the University of Bridgeport. My new assignment calls for travel (India, Japan, Hong Kong, U.K., etc.)."

**C. Michael Aho**, PhD '78, has been named VP and senior international economist at Prudential Securities, Inc., with Prudential of America Insurance, in New York City. Previously, he was director of economic studies on the Council on Foreign Relations. ... **Alberto Giovannini**, PhD '84, is the author of *Studies in International Taxation* (University of Chicago Press, 1993). According to the book jacket, "As the global economy continues to evolve, events such as the unification of European markets have prompted economists and policymakers to consider whether the current system of taxing income is inconsistent with the trend toward liberalized world financial flows and increased international competition. To help assess the effectiveness of existing tax policies and incentives, this volume presents new research on how taxes affect the investment and financing decisions of multinationals today." Giovannini is the Jerome A. Chazen Professor of International Business at Columbia University, and a member and coordinator of the Council of Experts of the Italian Treasury Ministry.

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## XV MANAGEMENT

**Franklin C. Basler**, SM '75, sends word from Westport, Conn., where he lives and works as president of Basler Associates: "I continue as an independent organizational development consultant, specializing in work redesign. This year I shall also complete my training as a psychoanalyst." ... **Kathleen Barrie**, SM '86, is living and working in Houston, Tex. Her position is senior business analyst at Pennzoil Exploration & Production Co. ... **Dimitry V. Erez**, SM '88, recently joined the partnership at SDI Industries in Los Angeles, Calif. ... **Samuel Appleton, Jr.**, SM '57, writes: "Since July, I've been an engineering manager at Eastern Acoustic Works in Whitinsville, Mass. ... **Christopher W. Jenkins**, SM '86, writes: "I sold my company and have gone to work for acquirer Message Center USA, a nationwide telecommunications company. Son Oliver Winborne born September 5, 1993." ... From Rockville, Md., **Gerald S. Lutes**, SM '74, reports: "My wife and I adopted a boy from Panama in December '92. My work as a principal systems engineer at Frederic R. Harris, Inc., is engineering relating to traffic signals and similar traffic control equipment." ... **Toby S. Mannheimer**, SM '77, is living and working in Miami. He is director of human resources and total quality at United Technologies. ... **Carol Holmes Redfield**, SM '87, writes: "Matthew McKernon Redfield was born on April 13, 1993. Chris Redfield, SM



'87 (I), and I love being parents. I'm still at Decision Focus. Chris is now in corporate finance at Silicon Graphics." . . . Carol Smith, SM '92, reports: "I'm currently implementing a new sales and marketing decision support system at the Solaris Group at Monsanto Agricultural's consumer packaged goods division. It's fun, but it means I'm spending all my time in San Ramon, Calif., near San Francisco. Stewart Sonnenfeldt, SM '92, had a blast of a wedding!" . . . From Sterling Heights, Mich., Marie Regas Kaufman, SM '83, writes: "I have a one-year-old girl and another on the way. At work I am working on identifying new opportunities to help the customer become more effective—business process reengineering." . . . From Wayland, Mass., Sarah Shoaf Cabot, SM '85, reports: "I am continuing pursuit of a law degree at Boston College, fitting it around family life. We welcomed our second child, Hannah, on October 13, 1993. We are all doing well." . . . Mark Deck, SM '79, sends word from Lincoln, Mass.: "I was promoted to VP, leading Mercer Management Consulting's efforts to improve product development performance by reengineering new product and service development processes." . . . From Cheshire, Conn., Tony Docal, SM '85, writes: "My wife, Terri, delivered John Carlos on July 1st. Tommy (24 months) is delighted to have a brother, and we are all doing great." . . . From Haverford, Pa., we receive news from Jeff Magill, SM '85: "After returning to Philadelphia, the city of my birth, to help run a family business (is that an oxymoron?), I found that blood may be thicker than water, but it tends to be drawn

more frequently when working with family members. So, a year ago, I joined Telebase, a producer of computer-based information services, as VP for marketing and sales. Business is growing and so is my own family. Lynn had twins in July, bringing our kid count to four, two girls and two boys. We would love to see



**Robert Brierley**

anyone passing through the Philadelphia area." . . . Robert E. Brierley, SM '75, has been named CFO at Phoenix Controls Corp. in Newton, Mass. In his new position, he is responsible for a broad area of administrative and financial functions. His prior position was president and CEO (and earlier as CFO) at Cybergraphic Systems, Inc. He also served as treasurer for Unitrode Corp., manufacturer of electronic components. Phoenix Controls Corp. designs and manufactures precision airflow controls for critical room environments.

Charles D. Axelrod, '48, reports from Wilmington, Ohio: "I am retired and enjoying it by traveling. When not traveling, I try to serve my community by volunteering in nursing homes, in the local hospital, and with hospice. I enjoy the company of and the accomplishments of my children." . . . Ruth Bardenstein, SM '82, sends word from Ann Arbor, Mich.: "I am manager of vehicle quality and reliability at TASC's Detroit

# CourseNews

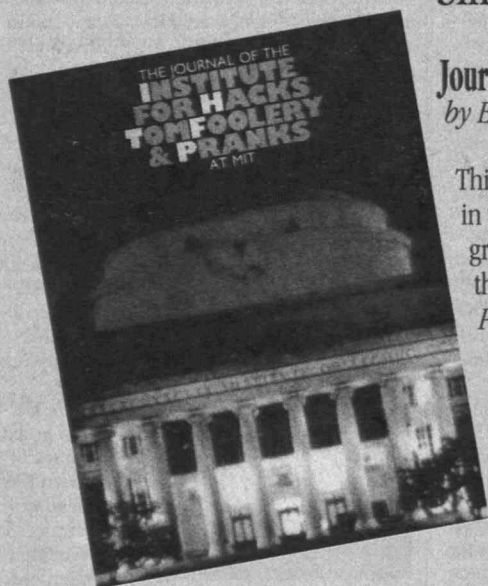
office. I've two children: Emily, 4 years, and Natalie, 14 months." . . . From Naples, Fla., George E. Williams, SM '49, writes: "I have been retired since 1982. Very busy in civic and club affairs plus cruising on our yacht. Can't understand how I found time to work for a living, which was my occupation for over 40 years. Last position was VP at United Technologies." . . . Robert E. Brooks, Jr., PhD '75, reports from Los Angeles: "RBA Consultants was founded in 1987 to provide custom software development and information systems consulting services to leading-edge product development and manufacturing companies. Our specialty has been advanced analytic methods for both strategic and operations management." . . . R. Sergio Solanot, SM '92, sends word from Buenos Aires, Argentina: "I recently took over a small-size catering company, Catering S.A. I developed a growth plan that includes building an Italian restaurant chain and I am currently executing it. Life continues to be as exciting as at MIT, but a lot more hectic." . . . Don Barefoot, SM '78, writes that he relocated to Pittsburgh in 1991. He is president of Chromalox, a division of Emerson Electric. . . . From Brooklyn, N.Y., Paul Jandreau-Smith, SM '86, reports: "I was recently promoted to senior VP, account director at Young & Rubicam's Wunderman Cato Johnson subsidiary, a direct marketing agency. My wife, Brigitt, started a new job with a not-for-profit

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that finances supportive housing for people living with AIDS. She loves the job!" . . . **John Martin**, SM '83, has been promoted to principal competitive analyst within corporate marketing at Stratut Computer in Marlborough,



**Elizabeth Altman**

Mass. . . **Elizabeth Altman**, SM '92 (II, XV), manufacturing engineer with Motorola in Boynton Beach, Fla., is one of 30 U.S. engineers chosen to spend a year working in Japan to gain hands-on experience with Japanese manufacturing practices. The engineers are part of the first-ever technology transfer program known as the U.S.-Japan Manufacturing Technology Fellowship Program. Altman left in early January and is working with the Sony Corp.

**Eric D. Beinhocker**, SM '92, writes: "This summer I watched my wife, Ruth, win a bronze medal at the World Rowing Championships in Prague. Also had a good time seeing classmates in London, Paris, and Copenhagen this past spring and summer." . . . **Martin R. Strasmore**, SM '73, reports: "I'm having fun—consulting in re-engineering and technology management. Teaching and practicing Siddha meditation. Skiing, canoeing, and playing tennis. Being with my family—wife, Cassandra, and 6-year-old daughter, Sharada. Life is great!" . . . **Donald E. Hammer**, SM '58 writes: "I am a specialist in emergency medicine." . . . Word from **Nanette Hartley**, SM '81: "My husband, Art Hilson, recently got his private pilot's license. I decided to take a few 'self defense' emergency procedure lessons, and haven't stopped since! Flying is a great way to relax from the pressures of my consulting practice, and to sharpen my focus. Any GM '81s out there who have also discovered the sport?" . . . From Wilton, Conn., **Joseph R. Brenner**, SM '57, writes: "I retired in August '93 after 34 years with IBM, the last four in Tokyo. **Ray Philip**, SM '58, and his wife, Carol, visited in February 1992 as part of a Far East tour. Had a mini-reunion Halloween weekend in Mystic, Conn., with Marlyn & **Don MacLellan**, '57, and Sandy & **Mel Blitz**, SM '57, along with my wife, Zelda (a former IBM systems engineer), now exploring life after Big Blue." . . . **Peter Bittinger**, SM '93, reports from North Wales, Pa.: "I married Terri Ann Thatcher on May 30, 1993. I'm working with **Kevin Boucher**, SM '93, at IMS America, where I am a systems engineer." . . . **Michael D. Peterson**, PhD '92, reports: "I am a second-year assistant professor in the School of Public & Environmental Affairs at Indiana University." . . . **Benjamin Margulies**, SM '64, is president and owner of P&R Fasteners in South Plainfield, N.J. . . . **Bruce A. Jacobson**, SM '93 (XV, TPP), is working on a video dial-tone project for SNET Multi-Media Services. . . . **Ken Kershner**, SM '88, has a new baby, Alexandra Leigh, born August 11, 1993. . . . From New York City, **Miguel D. Browne**, SM '88, writes to let us know that he is VP at Emcor Eurocurrency Management Corp." . . . From Coral Gables, Fla., **Jorge R. Peschiera**, SM '75, sends word: "From March through May 1993, I negotiated the purchase of the Peruvian subsidiary of the Bata Shoe Organization and since May I have been directing its

restructuring, which has included raising \$6.7 million in equity and debt. Additionally, last August, I was designated the official debt negotiator of the Republic of Peru, responsible for restructuring \$7 billion due by the republic to foreign commercial banks." . . . **Jon Dennis**, SM '86, reports: "I've been promoted to product line manager for light commercial vehicles/recreational vehicles at General Motors-Europe. Wife, Patricia, daughter, Rachel, and I moved to the Rüsselsheim, Germany area in January '94. . . . **Jean C. Lavoie**, SM '65, is senior VP for finance at Unigesco, Inc., in Montréal, Quebec. . . . **Masayuki (Masa) Tada**, SM '93, reports from Tokyo: "My wife, Setsuko, and I had our third child, a girl, Mariko, in September 1993. I am a strategic planner in the NKK Corp.'s Americas Department." . . . **Robyn M. McLaughlin**, PhD '88, has been named associate professor of finance in the School of Management at Suffolk University in Boston. Prior to this she was assistant professor of finance at Boston College." . . . **James J. Forese**, SM '59, has been named chair of IBM Credit Corp. and VP of IBM Corp. in Stamford, Conn. Prior to this, he was VP for finance at IBM Corp. . . . **John Lively**, SM '85, sends e-mail: "I've been promoted to manager of forecasting and analysis for Corning's OptoElectronics Sector, and am now responsible for the worldwide market forecasts for optical fiber and components." . . . From Brookline, Mass., **Brian R. Harris**, SM '90 (VI, XV), reports: "I joined Oracle Consulting's new business process reengineering practice to launch the practice in the New England region. It's very exciting!" . . . **Steven Spear**, SM '93 (II, XV), sends e-mail: "Greeting from Japan. All is well here. I am a visiting researcher at the University of Tokyo, participating in a MITI proposed international consortium to develop advanced manufacturing technologies. I just returned from Kyushu, where I gave a talk at the Kyushu Institute of Technology, and from Kyoto, where our consortium was having a week-long meeting with Japanese, American, and European partners. The Sloan '91 group stays in pretty close contact with each other, and schedules a once-a-month get-together. Fortunately, our meeting place has been able to accommodate a growing crowd of new arrivals and new spouses." . . . **Robert Young**, SM '92, is living and working in Santa Clara, Calif. He is a product marketing engineer at Intel Corp. . . . **Peter Fader**, '83 (XVIII), SM '85, PhD '87, sends e-mail: "I'm pleased to say that I've been granted tenure at the Wharton School of the University of Pennsylvania; as of next July, I will be associate professor of marketing." January and is spending a year working with the Japanese host company, Sony Corp.



**Arthur Gerstenfeld**

**Arthur Gerstenfeld**, SM '66, PhD '67, and Donald Berth recently founded Worcester Polytechnic Institute's Entrepreneurs Collaborative to prepare undergraduates to start their own businesses or head new business ventures in established companies. "Gerstenfeld, who teaches courses on innovation and entrepreneurship at both the undergraduate and graduate level, has been an entrepreneur and an 'intrapreneur.' His intrapreneurial



activities at WPI have included forming the Management of Advanced Automation Technology Center, which he currently directs, and establishing the Manufacturing Engineering Applications Center and the MBA program. As an entrepreneur, he recently established a company engaged in computer-simulation and expert systems," states a WPI news release.

John E. Martin, SM '40, of Algoma, Wisc., died on October 15, 1993. He joined Arthur Anderson and Co. in 1940 where he introduced and pioneered the development of their practice of production control and operations research. He became a partner at the firm in 1954. Later he was a founder of Andersen Consulting. He was an Air Force major in WWII in charge of revenue traffic in the Division of Air Transport Command.

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## SLOAN FELLOWS

From Raleigh, N.C., J.G. (Jerry) Hart, SM '61, writes: "I am still active in management consulting with special emphasis on helping organizations become world-competitive through gain-sharing. We help managers have fun on the job and get their job done easier and faster so they can spend more time on the golf course! New larger office; fax 919-571-0231." Hart is president of Hart & Associates, Inc. . . . Patrick L. Meyer, SM '91, reports: "I have been transferred from the position of business development manager of the Gulf of Mexico Division, located at Lafayette, La., to the position of general manager for business development, Conoco U.K. Ltd., located at Aberdeen, Scotland. Conoco U.K. Ltd. is the business unit for U.K. North Sea Oil and Gas Exploration and Production." . . . George P. Chandler, Jr., SM '76, lives in La Jolla, Calif., and works in nearby San Diego as a district director at the U.S. Small Business Administration. . . . From Scarsdale, N.Y., Ichizo Kutsukake, SM '93, writes: "Four months have passed since I started to work for Mitsui Steel Supply, Inc. My responsibility is to make marketing strategies for cold-rolled steel products to be produced by Inland Steel. I will be staying in New York for four or five years." . . . Clive M. Norris, SM '92, sends word from London, where he is head of deregulation review at the Health & Safety Executive: "My main news is that I married on March 27, 1993. I met my wife, Jennifer, at the Sloan School, where she was on exchange from London Business School." . . . LeRoy E. Day, SM '60, writes: "I'm enjoying retirement. My main activity is designing, building, and flying radio-control scale models of aircraft."

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## SENIOR EXECUTIVES

From Brookfield Wisc., Thomas K. Nelson, '85, writes: "I have been retired for one year. I am an unpaid consultant working for a major library located in a suburb of Milwaukee and for an environmental group also located near Milwaukee." . . . Raymond H. Alleman, '81, has retired as senior VP at ITT Corp. in New York City.

The Association of Alumni and Alumnae has been notified of the following deaths: Thomas J. Kessler, '86, of East Rochester, N.Y., on December 19, 1992; Leonard W.

Adams, '67, of Sarasota, Fla., on August 3, 1988; and William L. Ramsey, '57, of Atlanta, Ga., on July 4, 1984. No further information was provided.

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## MANAGEMENT OF TECHNOLOGY

Captain Audie Hittle, SM '91, wrote us recently that "Technology transfer and cooperative R&D has become a U.S. National policy." Audie's thesis research and subsequent implementation initiatives are charting a new path of profitable partnerships for government and industry interactions. His expertise in cooperative R&D was featured in several magazine articles this past year including publications such as *IEEE Spectrum*, *Aviation Week and Space Technology*, and *Technology Transfer Business*. He hopes that more Sloan MOT's will contact him when visiting Boston to strengthen the network. . . . Naoki Kato, SM '91, is now working as a lab strategist at NTT LSI Labs in Kanawaga, Japan. . . . Barbara Pound, SM '90, was in the United States last August and September, where she visited with Flora and Nabil Alyassini, SM '90, in San Francisco. She wrote us to say that she spent the holidays with her daughter in Perth, so she had a "warm—not a white—Christmas this year. . . . Vandana Upadhyay, SM '92, contributed her insights to an article written by Sam Pitroda, entitled "Development, Democracy, and the Village Telephone," published in the November-December 1993 issue of the *Harvard Business Review*. She is now working with Pitroda in the United States, developing and marketing new products that offer integrated solutions for communications, personal computing, and multi-media. . . . David Mattis, SM '92, wrote the program office recently to say that "the Mattis are doing fine." David is now program director of the Cadillac portfolio of the Cadillac Luxury Car Division at General Motors. . . . Mike Patrick, '79 (VI), SM '80 (VI), SM '92, has accepted a full-time position as a principal engineer at Motorola Codex in data networking, so he's on the "technical, not management, ladder at the moment." . . . Ted Finch, SM '84, has developed a new investment product for corporate pension plans using the "market neutral" strategy. Ted was featured in an article in the April 1993 issue of *Institutional Investor*. . . . Rita Jedrzejewski, SM '93, wrote us last fall that she is "expecting a baby....I'll have to see which of my MOT experiences will have been the best preparation for this (I suspect the interactions with MOT children)." . . . Sigmund Kvernes, SM '93, promoted the MOT Program in a speech he gave for the managers in his company, Sintef Unimed. He tells us there will be potential candidates for the class of 1995-96. He and his wife, Anne, also had a visit from Professor Tom Lee, in Trondheim in October, 1993, to talk about TQM for the local business community. . . . B. Joseph Pine II, SM '93, left IBM at the end of June 1993 to form his own company. He is "focusing on speaking, teaching, and consulting with companies to help them embrace and implement Mass Customization." He writes that "it is going great so far! I love it."—MOT Program, MIT, E56-290, Cambridge, MA 02139.

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# CourseNews

## XVI AERONAUTICS AND ASTRONAUTICS

Edwin N. Myers, SM '61, writes: "I am an adjunct research staff member at the Institute for Defense Analyses in Alexandria, Va." . . . Donald C. Fraser, '63, SM '63, ScD '67, has been named director of the new Boston University Center for Photonics Research. He has also been appointed professor of aerospace and mechanical engineering in the College of Engineering. Fraser joins Boston University from the Department of Defense, where he served as principal deputy undersecretary of defense, acquisition. In this position, Fraser oversaw a budget of more than \$100 billion and supervised a direct staff of 650 senior managers and six defense agencies employing more than 100,000 people. For his work there, he was awarded the Defense Distinguished Service Medal, the highest honor accorded by the department to civilians. Boston University was awarded a \$29 million federal grant in May 1992 to establish a facility to explore the mechanics and applications of photonics—the design of practical devices using light in new ways. In the '60s, Fraser was part of a technical team at MIT that designed a digital control system for the Apollo Command and Lunar Modules, representing one of the first uses of digital computers for complex vehicle control. Prior to joining the DOD, Fraser was affiliated from 1962-90 with the Charles Stark Draper Lab, formerly known as the MIT Instrumentation Lab. He joined the Lab as a member of the technical staff and advanced until he was appointed executive VP and COO in 1988. In addition, from 1970-90, Fraser was a Course XVI lecturer.

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## XVII POLITICAL SCIENCE

Renee Marlin-Bennett, SM '83, PhD '87, writes: "My book, *Food Fights: International Regimes and the Politics of Agricultural Trade Disputes*, has been published by Gordon and Breach." . . . From Rockville, Md., Avivah D. Litan, SM '79, reports: "I was recently promoted to a division chief at the World Bank." . . . Franklin D. Margiotta, PhD '79, sends word from Fairfax Station, Va.: "I have had two major publishing events as the president and publisher of Brasset's (U.S.), Inc., a MacMillan company. In January 1993, as executive editor and publisher I published the now highly acclaimed *International Military and Defense Encyclopedia* in six volumes. Last October, I published Brasset's most important and successful book so far, *Worth It All: My War for Peace*, by former Speaker of the House Jim Wright. I cohosted the book launch with Larry King and Speakers Albert, O'Neill, and Foley, on October 27th. I welcome



manuscripts from MIT people in the fields of foreign policy, defense, and national and international affairs."

Robert H. Bates, PhD '69, has co-edited *Africa and the Disciplines: The Contributions of Research in Africa to the Social Sciences and Humanities* (University of Chicago Press, 1993). According to the book's press release, "African Studies, contrary to some accounts, is not a separate continent in the world of American higher education. Its intellectual borders touch those of economics, literature, history, philosophy, and art; its history is the story of the world, both ancient and modern. This is the clear conclusion of *Africa and the Disciplines*, a book that addresses the question: Why should Africa be studied in the American university? The question was put to distinguished scholars in the social sciences and humanities, prominent Africanists who are also leaders in their various disciplines. Their responses make a strong and enlightening case for the importance of research on Africa to the academy."

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## XVIII MATHEMATICS

From Dublin, Ireland, John Miller, PhD '65, sends an announcement: "In July of 1993 the MIT Club of Ireland was formally convened. The club hopes to bring together MIT alumni/ae living in Ireland for social and educational events. The annual dinner is slated to be held toward the end of January and it is hoped that a guest lecturer from MIT will be invited towards the end of April. The latter will be a public event from which it is hoped the club will benefit. The 1993 committee president was John Miller. The club looks forward to contact from Irish MIT alumni/ae living elsewhere." . . . Mike Freiling, PhD '77, sends word from Lake Oswego, Ore.: "I have been named marketing manager for benefits products at Wyatt Software. My responsibilities include marketing the company's software products for benefits, compensation, and human resources administration. Wyatt Software is a fully-owned subsidiary of the Wyatt Company, an international human resources consulting firm." . . . Two MIT alums have been named to professorships at Boston University. Frederick Blundell, '84 (VIII, XVIII), has been named assistant professor of mathematics at the university's College of General Studies, and Robert H. Gross, PhD '87, has been named visiting associate professor of mathematics at the university's College of Liberal Arts. Blundell has been a teaching fellow and lecturer in the Mathematics Department at BU since 1986. From 1991-92, he worked as a computer specialist at the Smithsonian Astrophysical Observatory, where he assisted in the computer enhancement of solar images from NASA's Skylab mission. Gross, a specialist in number theory, has taught at BU since 1984. He also serves as a consultant to the Institute for Defense Analyses.

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## XX APPLIED BIOLOGICAL SCIENCES

From Reston, Va., Mary Rose Kornreich, SM '67, PhD '70, writes: "I am practicing environmental law with the Washington, D.C., firm of Jenner & Block. My husband, Ted, is a systems engineer with SAIC. My oldest son, Doug, is practicing law in Savannah, Ga., while my younger son, Bryan, is in his second year at Johns Hopkins Medical School." . . . Aaron Brody, '51, PhD '57, marketing manager at Rubbright-Brody, Inc., in Eagan, Minn., has been awarded an Honorary Life Membership in the Institute of Packaging Professionals (IoPP). According to a Rubbright-Brody news release, "The award was given in recognition of Brody's more than 25 years of service and leadership in the packaging industry, his many technical contributions to the field, and his stewardship to IoPP as an officer, grass-roots advocate, and mentor. The prestigious award joins others conferred upon Brody for his industry accomplishments by IoPP, the Institute of Food Technologists, the National Institute of Packaging and Logistics Engineers, and others." Brody is the author of six textbooks on packaging, and is a contributor to and editorial board member of several food and packaging journals. Brody is a professor at St. Joseph's University in the Department of Food Marketing.

William T. L. McComis, PhD '64, of Worthington, Ohio, died on September 26, 1993. He was employed by Battelle Memorial Institute as a research scientist in food science and as an adjunct professor in the Department of Nutrition and Food Science at The Ohio State University. He was a professional member of the Institute of Food Technologies, Society of Rheology, American Institute of Physics, and Sigma Xi. McComis was listed in *American Men of Science* and International *Who's Who in Medical Engineering*.

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## XXI HUMANITIES

Bruce Mazlish, professor of history at MIT, is the author of *The Fourth Discontinuity: The Co-evolution of Humans and Machines* (Yale University Press, 1993). According to the book jacket, "Mazlish discusses the complex relationship between humans and machines, pondering the implications of humans becoming more mechanical (our bodies increasingly hooked up to artificial parts) and of computer robots being programmed to think. Mazlish argues that just as Copernicus, Darwin, and Freud overturned our illusions of separation from and domination over the cosmos, the animal world, and the unconscious, it is now necessary to relinquish a fourth fallacy—that humans are discontinuous and distinct from the machines we make. . . . He argues provocatively that human nature is best understood in the context of the machines and tools we have created and that humans and our creations—computer robots—will eventually evolve into two new species coexisting in a symbiotic relationship."

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## XXII NUCLEAR ENGINEERING

George V. Neill, SM '71, writes from Overland Park, Kans.: "I am a partner with the power division of Black & Veatch. I am responsible for current power plant projects in Hawaii and Indonesia." . . . George Yadigaroglu, ScD '70, reports: "After a semester-long sabbatical at UC-Berkeley, I returned to my teaching and research at the Swiss Federal Institute of Technology in Zurich." . . . Domingo R. Giorsetti, SM '77, sends word: "I am on the board of directors of the Buenos Aires Institute of Technology. Since 1982 I have been president of the Buenos Aires MIT Club. I'm working now as a human resources manager at BUN, S.A., a company belonging to Pepsico Food International." . . . We receive word from Eric E. Sasson, SM '87, in Paris: "The good news of the year is my son, Jeremie, who makes me discover the pleasures of fatherhood, including the sleepless nights. I am still working for Sinuim-Cogedim, the land development subsidiary of Paribas Bank and I'm trying to work my way through the crisis. Anyway, it is still fun. I often miss Boston and MIT. It was a 'blessed year of study.'"

Donald L. Cook, SM '74, PhD '77, is director of pulsed power sciences at Sandia National Laboratories in Albuquerque, N.M. . . . Joseph Harrington, '61 (XIV), SM '63, ScD '66, has been named assistant dean for Resource Development at MIT. Upon receiving his degrees from MIT, Harrington spent two years working in Vienna, Austria, as a reactor physicist. Upon his return to the States, he spent five years with the Commonwealth Edison Co. in Chicago. He later joined the New England Electric System companies as a project manager and in 1987 he was named VP of the New England Power Co., the position he most recently held. Harrington has maintained close ties to the Institute serving on the Visiting Committee of the Department of Humanities from 1972-80, and as a member of the Educational Council from 1980-88.

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## XXIV LINGUISTICS AND PHILOSOPHY

John A. Goldsmith, PhD '76, is the editor of *The Last Phonological Rule: Reflections on Constraints and Derivations* (University of Chicago Press, 1993). A release states: "In this provocative book, leading linguists and computer scientists consider the challenges that computational innovations pose to current rule-based phonological theories and offer new conceptions of phonological theory for the 1990s, the most radical of which proposes that phonological processes cannot be characterized by rules at all, but arise from the dynamics of a system of phonological representations in a high-dimensional vector space of the sort that a neural network embodies." Goldsmith is chair of the Department of Linguistics at the University of Chicago. He is the editor and translator for *Syntax and Human Experience*, also published by the University of Chicago Press.

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# TPP

TECHNOLOGY  
AND POLICY PROGRAM

David Hanrahan, SM '79, has a new position at Techecon in London. . . . Tatsujior Suzuki, SM '79, has accepted a position as a research associate at MIT's Center for International Studies. He has started working for a two-year project entitled "International Responses to Japan's Plutonium Programs: Analysis of International and Domestic Factors" funded by the Power Reactor and Nuclear Fuel Development Corp. The main focus of the study is to analyze international political implications of Japan's plutonium policies. Tatsujior has also become a member of a newly created Project on Political Economy of Global Energy at CIS. . . . Jean Tilly, SM '83, and Joseph Karam, SM '85, have recently founded ECODIT, an international environmental consulting firm with offices in Fairfax, Va., near Washington, D.C., and Paris, France. Since its creation, ECODIT has been quite successful working on environmental consulting assignments in Europe and the United States and around the Mediterranean. . . . Scott Vance, SM '88, recently joined the firm CH2M Hill, an environmental consulting firm. He is working in the area of hazardous waste remediation. Sometime during the summer of 1994, he will be moving to the Boise, Idaho, office. Good luck with the move, Scott! . . . Jason Johnston, SM '88, joined the staff of the Regulatory Impact Analysis Project as a senior research associate in October 1993. He is cur-

rently working on a study on the impact of science policy decisions made in light of uncertainty or knowledge gaps in our understanding of costs and benefits associated with environmental regulation. . . . Greg Martin, SM '88, completed a nine-month tour in Central America in July 1993. That same month, Gregg represented U.S. Southern Command in the area of U.S. Strategy and Policy in Latin America at the U.S. Naval War College's "Global Game," a major strategy held in Newport, R.I. He also traveled to South Korea, where he spent three weeks participating in a major U.S.-Republic of Korea military exercise. Upon his return to the U.S. Army's First Corps at Ft. Lewis, Gregg moved into a new position as operations officer of an Army Combat Engineer Battalion. Gregg reports that his wife, Maggie, and their three sons are all doing great and enjoying life in the Pacific Northwest. . . . Richard Byrnes, SM '89, leads the transportation consulting activities in Booz Allen & Hamilton's Houston office. He has been working for maritime and rail clients in the Gulf of Mexico and Latin America, and his firm was recently selected to develop a master plan for the Port of Houston. . . . Taylor Aaron joined his parents, Jennifer and Jeff Dieffenbach, SM '89, on September 24, 1993. Jeff is currently the project manager of IBIS Associates, which is a business development consulting firm. He is also the business manager for Jennifer's architecture firm. . . . Todd Curtis, SM '90, writes to us that he and his wife have a six-month-old son, Alexander Malik Curtis. Todd is presently an airline safety analyst at the Boeing Co. in Seattle. He also

# CourseNews

started a small video production company to market educational videos to schools and libraries." . . . For almost two years, David Gold, SM '90, has been working as a regional manager for the National Institute of Standards and Technology's Manufacturing Extension Partnership. They are establishing a nationwide network of non-profit technical assistance centers for small- and medium-sized U.S.-based manufacturers. . . . Daniel Greenberg, SM '90, and Sara Weatherley were married on September 5, 1993. Best wishes! . . . Congratulations to Bertrand Rigaldies, SM '90, and Susan Doyle as they celebrated their wedding on November 27, 1993. . . . Emmeline and Phillippe Rose, SM '90, are the proud parents of Benoit, who was born on September 23, 1993. Philippe has been promoted to technical planner for ICI Polyurethanes. . . . Marguerite (Anne) Wagner, SM '91, writes that she is currently an air-quality planner for Wisconsin Power and Light Co. (no, it is not in Milwaukee). She would also like to extend an invitation to visit and see how beautiful Wisconsin is. . . . Lisa Ann Prosser, SM '92, is employed as a consultant at the Wilkerson Group, a health care management consulting firm. Lisa and Walid Yassir are planning a 1995 wedding. . . . Michael Sullivan, SM '92, and Gretchen Demeon were married on October 30, 1993. Alan Davidson, SM '92, and

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Michael Goldstein, SM '92, attended their wedding, which took place in Holyoke, Mass. Best wishes to Mike and Gretchen!" . . . Sitaram "Ram" Josyula, SM '93, has left Digital Equipment Corp. and Massachusetts and started a strategic management consulting company called Strategic Solution in San Jose, Calif. . . . Jerome Muller, SM '93, is working for the French equivalent of MIT. He is in charge of promoting the development of small- and medium-sized companies in the administrative region of Paris, i.e., improving the relationship between research labs and companies (technology transfers); advising companies on market opportunities, or on how to finance their growth—Richard de Neufville, TPP, MIT, Room E40-252, Cambridge, MA 02139.

## STS PROGRAM IN SCIENCE, TECHNOLOGY & SOCIETY

Loren Graham was in Moscow on December 10 as chair of the selection committee for the "Initiative in the Former Soviet Union" of the John D. and Catherine T. MacArthur Foundation, which has received several thousand proposals from former Soviet countries for support in such areas as environmental protection, minority and women's rights, and political and economic reform. Graham's book *The Ghost of the Executed Engineer: Technology and the Fall of the Soviet Union* was published in October by Harvard University Press. In December it was listed in the *New York Times* among the "Notable Books of 1993." . . . Hugh Gusterson organized a panel, "Double Vision: Fieldwork on Both Sides of Political Conflicts" at the November meeting of the American Anthropology Association Meetings in Washington, D.C. His article, "Realism and the International Order After the Cold War" was recently published in *Social Research* 60 (2): 279–300.

Carl Kaysen participated in a conference on "Norms and Emulation in International Behavior" organized by the Center for International Relations at UCLA. He will spend the month of February at the UCLA Center. . . . Evelyn Fox Keller is a member of the Bulbankian Commission for the Restructuring of the Social Sciences. In July 1994, she will be a visiting professor at the University of Bremen. . . . Kenneth Keniston joined the Committee on Selection of the John Simon Guggenheim Memorial Foundation in New York City in February. With David Guston, PhD '93 (XVII), he is editing a book for the MIT Press entitled *The Fragile Contract*. . . . Charles Weiner chaired a panel on "Personality, Reality, and Responsibility: The Scientist and the Historian" in November in Santa Fe, N.M., at the annual meeting of the History of Science.—Graham Ramsay, STS Program, MIT, Room E51-128, Cambridge, MA 02139.

## Deceased

The following deaths have been reported to the Alumni/ae Association since the *Review* last went to press:

Benjamin M. Greely, '18; November 24, 1993; Medfield, Mass.  
Max R. Butter, '21; September 11, 1992;

Chestnut Hill, Mass.  
John M. Sherman, '21; November 24, 1993; Belmont, Mass.  
Howard F. Baldwin, '22; November 1, 1993; Baltimore, Md.  
Harold E. Burnham, '22; April 9, 1993; Sanibel, Fla.  
Frederick O.A. Almquist, '23; November 5, 1993; Wethersfield, Conn.  
Leonard F. Kiley, '23; November 24, 1993; Salem, Mass.  
William L. Searles, '23; December 25, 1992; Los Angeles, Calif.  
Ernest W. Thiele, SM '23, ScD '25; November 29, 1993, Evanston, Ill.  
Louis Tanner, SM '24; May 9, 1993  
James A. Drain, '26; October 27, 1993; Delray Beach, Fla.  
G. Warren Hamblet, Jr., '26; October 18, 1993; North Andover, Mass.  
Dorothy Quiggle, '26, SM '27; August 28, 1993; State College, Pa.  
E. Warren Ward, '27; November 29, 1993; Lake Worth, Fla.  
Charlton P. Whittier, '27, SM '28; August 18, 1993; Perrysburg, Ohio  
George J. Meyers, Jr., '29, SM '30; October 30, 1993; Wyomissing, Pa.  
John F. Schipper, '30; November 4, 1984; Palo Alto, Calif.  
Morris F. Shaffer, '30; August 4, 1993; New Orleans, La.  
Wayne A. Soverns, '30; August 9, 1993; Portland, Ore.  
Philip A. Coleman, '32; December 6, 1992; Saint Augustine, Fla.  
Harry M. Krutter, '32, SM '33, PhD '35; November 18, 1993; Glenside, Pa.  
Howard M. Quigley, '32; September 3, 1993; Las Cruces, N.M.  
Theodor Szarvas, Jr., '32; October 29, 1992; New York, N.Y.  
Horace S. Beattie, '33; September 6, 1993; Lexington, Ky.  
Walter T. Brownell, '33; September 1, 1991; Prattville, Ala.  
Thomas M. Chadwick, '33; December 1, 1993; Brunswick, Me.  
Horace K. MacKechnie, '33; July 30, 1992; Moorestown, N.J.  
Bernard D. Gilbert, '34; October 2, 1993; Silver Spring, Md.  
Frederick C. Johnson, '34; March 21, 1991; Riverside, Conn.  
Henry A. Morss, Jr., PhD '34; November 17, 1993; Hardwick, Mass.  
Jerome L. Wien, SM '34; November 22, 1992; Chicago, Ill.  
George L. Ahrens, SM '35; January 2, 1993; S. Londonderry, Ver.  
John P. Bainbridge, Jr., '35; November 8, 1993; Vero Beach, Fla.  
Sidney V. Fox, '35, SM '46; November 12, 1993; Bethlehem, Pa.  
Herbert C. Thomas, '35; March 4, 1993; Wayne, Pa.  
Arnold A. Kruse, SM '36; May 18, 1993; Kula, Hawaii  
James B. Ames, '37, SM '48; October 13, 1993; Norwell, Mass.  
Albert C. Hall, '37, ScD '43; September 14, 1992  
Frank L. Moore, Jr., '37; November 10, 1993; Rye Beach, N.H.  
Horace H. Homer, '38; December 24, 1993; N. Falmouth, Mass.  
Franklin C. Johnson, SM '38; July 3, 1990; Chestertown, Md.  
C. Eric Olsen, '39; May 7, 1993; Marion, Mass.

Philip P. Irwin, Sr., '40; August 24, 1993; East Liverpool, Ohio  
Edward C. Bishop, '41, SM '42; September 27, 1993; Hilton Head, S.C.  
Louis J. Minbirole, Jr., SM '41; November 23, 1993; West Bloomfield, Mich.  
J. Paul Sanderson, '41; November 18, 1993; Winchester, Mass.  
Joseph H. Kline, '42; October 28, 1993; Miami, Fla.  
Audrey A. Bill, MPH '43; November 10, 1993  
George Feick, '43; November 27, 1993; Walpole, Mass.  
Joseph A. Connors, Jr., SM '44; December 26, 1991; Basking Ridge, N.J.  
Walter H. O'Connell, Jr., '45; December 25, 1991; Palm Harbor, Fla.  
Kermit Greene, '46; November 20, 1993; Newton Centre, Mass.  
Ensley O. Oglesby, Jr., MAR '47; June 3, 1993; Dallas, Tex.  
James H. Rial, Jr., SM '47; August 29, 1993; Jacksonville, Fla.  
Henry J. Bielecki, '48; January 20, 1989; Placida, Fla.  
Harold R. Nace, PhD '48; November 29, 1993; Providence, R.I.  
Gideon M. Boyd, SM '49; August 11, 1993; Saratoga, Calif.  
Carl M. Cooper, ScD '49; October 31, 1993; Okemos, Mich.  
Ingram Lee, II, '49; November 25, 1993; Dallas, Tex.  
Russell C. Noreen, '49; May 15, 1993; Arlington, Mass.  
Harold E. Rorschach, Jr., '49, SM '50, PhD '52; June 23, 1993; Houston, Tex.  
Marcus G. Communizis, SM '50; August 17, 1989; Pittsburgh, Pa.  
James B. Robinson, Jr., SM '51; July 31, 1993; Ponchatoula, La.  
Raymond J. DeCredico, '53, SM '54; November 1, 1993; Sea Isle City, N.J.  
John W. Romig, '54; May 29, 1993; Bloomfield, Mich.  
Murray H. Silverman, '54; June 9, 1989  
William L. Ramsey, '57; July 4, 1984; Atlanta, Ga.  
Seymour Gordimer, '61; May 8, 1992; Elizabeth, N.J.  
Nathaniel H. Kezell, Jr., '61, EAA '61; November 7, 1993; Marietta, Ga.  
Camille B. Draskoczy, '62; November 4, 1992; Weston, Mass.  
Roy G. Kidwell, '64; February 22, 1993; El Dorado, Ark.  
William T.L. McComis, PhD '64; September 26, 1993; Worthington, Ohio  
Janet E. Dingle, '66, SM '68; July 19, 1993; Palo Alto, Calif.  
Leonard W. Adams, '67; August 3, 1988; Sarasota, Fla.  
Edward A. Beddall, '69; December 31, 1992; Kennett Square, Pa.  
Leo E. Ramsauer, Jr., SM '69; August 19, 1993; Cupertino, Calif.  
Lawrence A.P. Smith, '69; May 29, 1993; Baie d'Urfe, Quebec, Canada  
Tobias R. Hanks, MAR '71; October 31, 1993; Newton, Mass.  
Glenda M.W. Skiffer, MCP '72; November 23, 1993; San Francisco, Calif.  
Kenneth B. Rice, '79; 1993  
Jeffrey E. Mai, '89, SM '84; June 26, 1993; Cincinnati, Ohio  
Sabrina J. Goodman, '90; November 5, 1993; Westminster, Calif.  
Jina Kim, '92; November 3, 1993; Cambridge, Mass.



# PuzzleCorner

It has been a year since I specified the size of the backlogs for the various kinds of problems that are printed; let me do so now. I have a multi-year supply of regular problems, two years of speed problems, but chess, bridge, and computer problems are in short supply. This may well mean simply that these specialty problems are of less interest, in which case my exhausting the current supply will lead to three regular problems per issue.

## Problems

**APR 1.** In a high-stakes game of rubber bridge with N-S vulnerable, West leads the spade king against 6NT. Jorgen Harmse wonders what dummy should play to the first trick?

- ♠ 8 3 2
- ♥ A K Q 7
- ♦ 7 6 5
- ♣ 5 4 2
- N
- S
- ♠ 5 4
- ♥ 6 3
- ♦ A K Q 4
- ♣ A K Q J 6

**APR 2.** Eugene Sard has a square sheet with side 2, which he has folded so that a vertex falls on the midpoint of an opposite side. How long is the fold line?

**APR 3.** Albert Mullin writes that real-number constants abound in mathematics, physics, chemistry, and engineering. They provide a "firmament" for computational activities. Here is a *new* real number constant that you may find amusing. Define  $f_n$  as follows

$$f_1 = \pi$$

$$e^{f_2} = \pi^\pi$$

$$e^{e^{f_3}} = \pi^{\pi^\pi}$$



SEND PROBLEMS, SOLUTIONS, AND COMMENTS TO: ALLAN GOTTLIEB  
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and so on. Put

$$F = \lim_{n \rightarrow \infty} f_n$$

Surely this limit exists. Further, convergence is *super* fast. The problem is to compute  $F$  to several decimal places using just a hand-held calculator.

## Speed Department

Speedy Jim Landau wants you to find an English word with three consecutive double letters; now one with five; now one with a triple letter. Why is 6 afraid of 7 and finally why can't you curse the Hudson?

## Solutions

**N/D 1.** Lester Steffens wonders what is the highest score a Bridge pair can obtain on a single hand (excluding illegalities and penalties for reneging, etc.) when neither of them has a card higher than a ten.

Bob Wake was able to obtain the max possible score (setting 7NT vulnerable re-doubled) with no card higher than a *nine*. Jorgen Harmse notes that these hands are called Yarboroughs.

If a total "helpmate" is allowed, West—with a hand headed by two nines, an eight, and two sevens, and a partner headed by a nine, two eights, and two sevens—can single-handedly take all 13 tricks defending seven notrump redoubled. West could lead the four and seven of hearts, then the six, nine, and three of diamonds, with opponents pitching the club honors and everyone who can follow playing just underneath the card lead:

		North	
		♠	Q J 10
		♥	—
		♦	A K Q J 10 8 5 2
		♣	J 10
		West	
		♠	—
		♥	7 4
		♦	9 6 3
		♣	9 8 7 6 5 4 3 2
		East	
		♠	9 8 7 6 5 4 3 2
		♥	8 5 2
		♦	7 4
		♣	—
		South	
		♠	A K
		♥	A K Q J 10 9 6 3
		♦	—
		♣	A K Q

**N/D 2.** Nob. Yoshigahara wants you to substitute the digits 1-9 once each in the following equation.

$$\frac{AB}{CDE} + \frac{FG}{HI} = 7$$

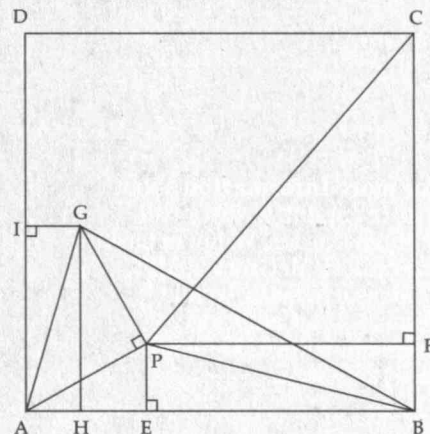
OOPS!! Somehow I managed to repeat the same problem in two consecutive issues (OCT and N/D). The solution for OCT 3 given last issue works just fine for this problem as well. The answer is

$$\frac{95}{247} + \frac{86}{13} = 7$$

**N/D 3.** John Rule has a point  $P$  situated inside a square  $ABCD$  so that  $PA=1$ ,  $PB=2$ ,  $PC=3$ . He wants you to calculate angle  $APB$  "using only the methods of Euclid."

Viewing Pythagoras and Euclid as "colleagues," I agree with Robert Holt, whose solution follows.

I suppose "methods of Euclid" means avoid analytic geometry. Anyway, in the diagram,  $EP \perp AB$ ,  $FP \perp BC$ ,  $G$  is chosen so that  $PG \perp AP$  and  $AP = PG$ ,  $GH \perp AB$ , and  $GI \perp AD$ . Then  $GH = AE + EP$ ,  $GI = AE - EP$ ,  $AP^2 - AE^2 = BP^2 - BE^2$  by the Pythagorean Theorem, and  $BE^2 - AE^2 = 3$ . Next,  $AB^2 = (AE + BE)^2$ , so  $BE^2 = AB^2 - AE^2 - 2AE \cdot BE$ , and  $3 = AB^2 - 2AE^2 - 2AE \cdot BE = AB^2 - 2AE(AE + BE) = AB^2 - 2AE \cdot AB$ . Similarly we obtain  $5 = BC^2 - 2BF \cdot BC = AB^2 - 2BF \cdot AB$ . From these two results we have  $2 = 2AE \cdot AB - 2BF \cdot AB$ , or  $1 = AB(AE - BF)$ , or  $AB \cdot AE - 1 = AB \cdot BF$ . Now a  $\triangle ABC = \frac{1}{2}AB \cdot GH = \frac{1}{2}AB(AE + EP)$ , a  $\triangle APG = \frac{1}{2}AP^2$ , and a  $\triangle ABP = \frac{1}{2}AB \cdot EP$ . Therefore a  $\triangle BPG = \frac{1}{2}AB(AE + EP) - \frac{1}{2}AP^2 - \frac{1}{2}AB \cdot EP = \frac{1}{2}AB \cdot AE - \frac{1}{2}AP^2 = \frac{1}{2}(AB \cdot AE - 1) = \frac{1}{2}AB \cdot BF =$  a  $\triangle BGP$ . Since triangles  $ABP$  and  $BGP$  have two equal corresponding sides and the same area, the included angles are congruent (or supplementary, but that is impossible by the construction of  $G$ ). Angles  $APB$  and  $BPG$  are equal and add to 270 degrees, hence each is 135 degrees. (Angle  $APB$  cannot be just 45 degrees as  $P$  is in the half of the square nearer side  $AB$ . Angle  $APB$  must be less than angle  $ADB$  which is 45 degrees.)



Continued on Page MIT 48



# MIT LIFE INCOME FUNDS

## MR. DENMAN KITTREDGE McNEAR

HOME: Kentfield, California

CAREER: Denman McNear's grandfather, George W. Kittredge, MIT Class of 1877 and a former chief engineer of the New York Central Railroad, was responsible for Mr. McNear's ambition to go to MIT and to be a railroader. Born in San Francisco, he entered MIT in 1942, left in 1944 to serve two years in the U.S. Navy, and finished his civil engineering degree in 1948. He then joined a Southern Pacific Railroad training program in California while earning an M.B.A. from Stanford. Starting as an instrument man on a surveying team, he spent his entire career with the Southern Pacific Transportation Company, rising to the position of president in 1976 and then chairman and CEO in 1982. He retired in 1990.

A past president of the Association of Alumni and Alumnae and current president of the Class of 1948, Mr. McNear has long been active in MIT affairs. He has been a member of the MIT Corporation, and serves now on the Educational Council, the Department of Civil Engineering Visiting Committee, and the Corporation Development Committee. He recently accepted the position of chair of the new Katharine Dexter McCormick '04 Society. He is also a long time volunteer with the Boy Scouts and Junior Achievement, Inc.

LIFE INCOME FUND: Denman K. McNear Charitable Remainder Unitrust.

QUOTE: "A special attraction of MIT's Life Income Funds is that they also allow donors to provide for other charitable causes from their trust remainder. Therefore I can honor some of my other commitments to youth and education through my MIT fund. I have designated the Marin Council of the Boy Scouts and Junior Achievement, Inc., as well as MIT, as beneficiaries."

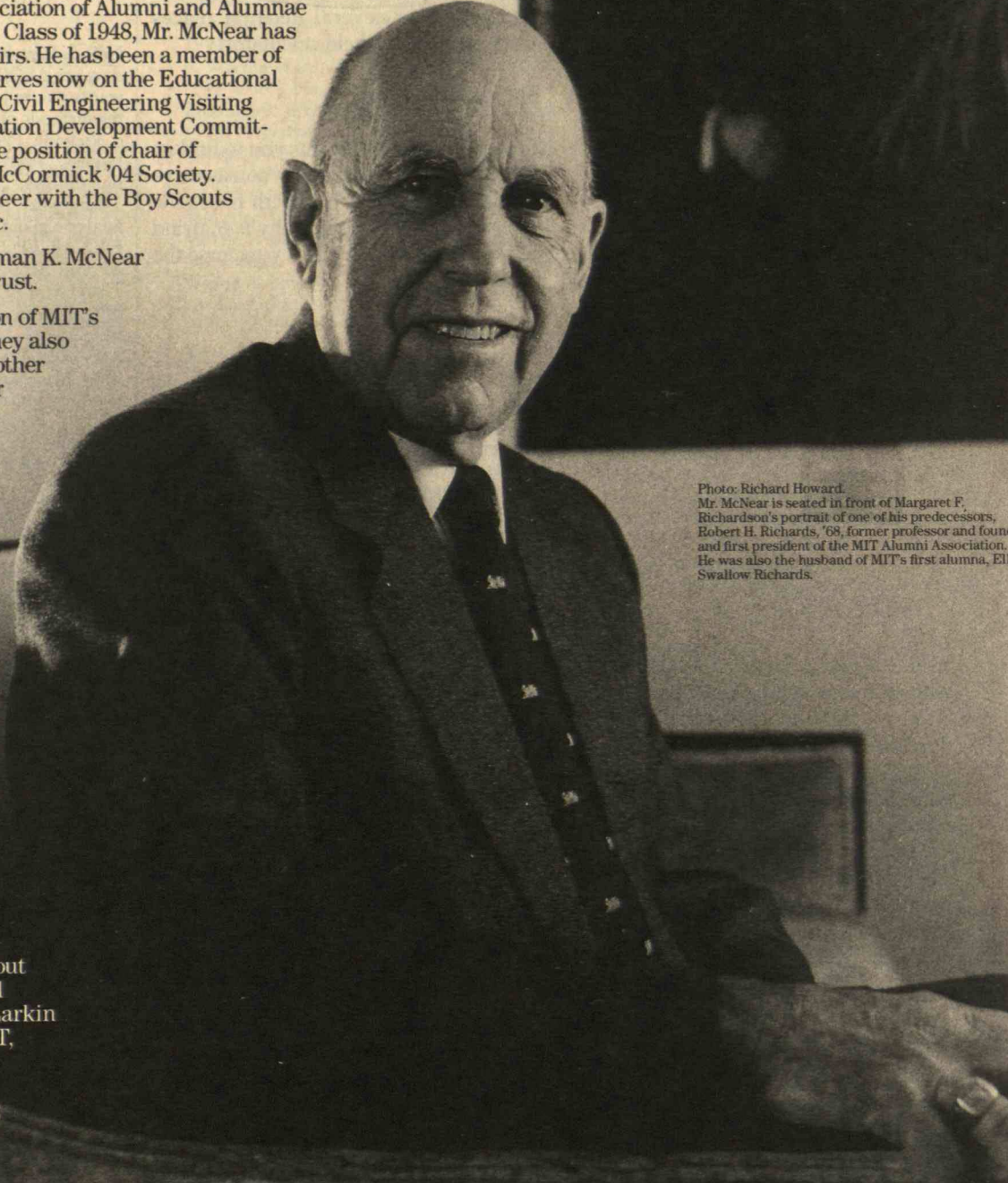


Photo: Richard Howard.  
Mr. McNear is seated in front of Margaret F. Richardson's portrait of one of his predecessors, Robert H. Richards, '68, former professor and founder and first president of the MIT Alumni Association. He was also the husband of MIT's first alumna, Ellen Swallow Richards.

For more information about gifts of capital, write or call D. Hugh Darden, W. Kevin Larkin or Frank H. McGrory at MIT, 77 Massachusetts Avenue, Room 4-234, Cambridge, Massachusetts 02139-4307; (617) 253-3827.

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# HOW SCHOOLS ARE SHORTCHANGING THE GIFTED

BY SALLY M. REIS

**A**FTER ONLY A FEW MONTHS, ANDI DECIDED THAT SHE DIDN'T want to go to school anymore because she already knew most of what was being taught in her first-grade class. While her classmates struggled to add single-digit numbers, she had begun to teach herself multiplication and division and was fascinated with negative numbers, word problems, and logic problems. She begged her parents to help her to learn these skills, but they were unsure how much they should help her, fearing the impact her precocity might have on her subsequent school experience. Her parents were justified in their concerns. Because schools have focused for decades on lifting up the lowest achievers, they are shortchanging the brightest students. High-ability children are not challenged in most



**T**he educational system is failing to provide suitable challenges to our brightest children as well as to all the others.

classrooms and endure a steady diet of dumbed-down textbooks, and repetition of skills that they have mastered years ago. They suffer from the elimination of many forms of advanced or accelerated classes because it has become politically incorrect to separate students on the basis of ability. Furthermore, a widely used teaching technique called cooperative learning assigns the highest-achieving students





PHOTOGRAPH BY ROBERT DOISNEAU  
HAND TINTING BY CINDY PARDY



to position of peer teacher—essentially pressing them into service as teacher aides.

Recent studies by the National Research Center on the Gifted and Talented portray a disturbing pattern of what happens in U.S. classrooms to high-ability students. For example, a survey of third- and fourth-grade teachers in several thousand public and private schools around the country revealed that fewer than half had ever received specific instruction in how to teach gifted students. Not surprisingly, given this lack of training, most teachers make at most minor modifications in the regular curriculum to meet the needs of gifted students. Another study entailing daily observation of third- and fourth-grade classrooms around the country revealed that more than 80 percent of the time, high-ability students received the same kind of instruction, of the same material, as the rest of the class. In a typical summary, a classroom observer reported that “the gifted student was inattentive during all of her classes. She appeared to be sleepy, never volunteered, and was visibly unenthusiastic about all activities.”

By underchallenging such students, U.S. schools delay and even halt these youngsters’ mental development. If instructional materials are not above the students’ level of knowledge or understanding, learning is less efficient and intellectual growth may stop. It is, for example, not surprising to find a bright first grader in an urban school who reads on a fifth-grade level—and who is reading only slightly above grade level when he or she enters fifth grade.

Because the work is too easy for them, many of our brightest students acquire poor work habits. A recent study conducted by the publisher of *Who’s Who Among*

*American High School Students* found that most high-achieving students study an hour or less a day. My own research on underachieving students in urban high schools has found a similar problem. In one representative response, a student commented: “Elementary school was fun. I always got A’s on my report card. I never studied when we were in class and I never had to study at home.”

Given this lack of rigor, it is not surprising that this country’s most talented students are hard pressed to compete in a global community. One study compared U.S. high-school seniors taking Advanced Placement courses in math and science with top students in 13 other countries. Although these students represent the top 1 percent of students in the nation, on an international basis they ranked:

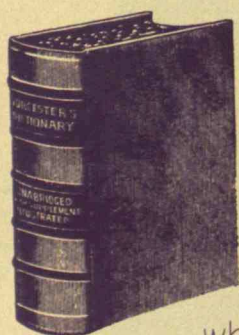
- 13 OUT OF 13 IN BIOLOGY
- 11 OUT OF 13 IN CHEMISTRY
- 9 OUT OF 13 IN PHYSICS
- 13 OUT OF 13 IN ALGEBRA
- 12 OUT OF 13 IN GEOMETRY AND CALCULUS

The picture is actually even bleaker than these figures suggest, since a higher percentage of the total school population in other countries takes these advanced classes than in the United States. When the results are controlled to eliminate this source of difference, American students scored last in all subject areas. “Our top-performing students are undistinguished at best and poor at worst” in comparison to their counterparts in other countries, according to a Department of Education report on this country’s inadequate treatment of the gifted. The report, entitled *National Excellence: A Case for Developing America’s Talent*, was distributed in October to every school district in the nation and made front page headlines

These sobering statistics may provide one explanation for why graduate school enrollments of U.S. students in mathematics and science have substantially declined in the last two decades while the number of foreign-born graduate students has increased. In 1992, for example, 44 percent of the doctorates in mathematics and physical sciences, and 60 percent in engineering, granted in the United States went to non-citizens.

Our most advanced students need educational experiences different from those they are currently receiving. Without these services, talents may remain unnurtured: We can’t develop the potential of a budding concert musician by providing him or her with ordinary music

SALLY M. REIS, a professor of educational psychology at the University of Connecticut, is a researcher at UConn’s National Research Center on the Gifted and Talented. Her studies on gifted education were the basis of the U.S. Department of Education’s report, *National Excellence: A Case for Developing America’s Talent*, released in October.



Schools  
shun the  
grouping  
of students  
by ability,

which is necessary  
to provide advanced content  
to the brightest children.



classes for one or two hours a week. We can't produce future Thomas Edisons or Marie Curies by forcing them to spend large amounts of their science and mathematics classes tutoring students who don't understand the material.

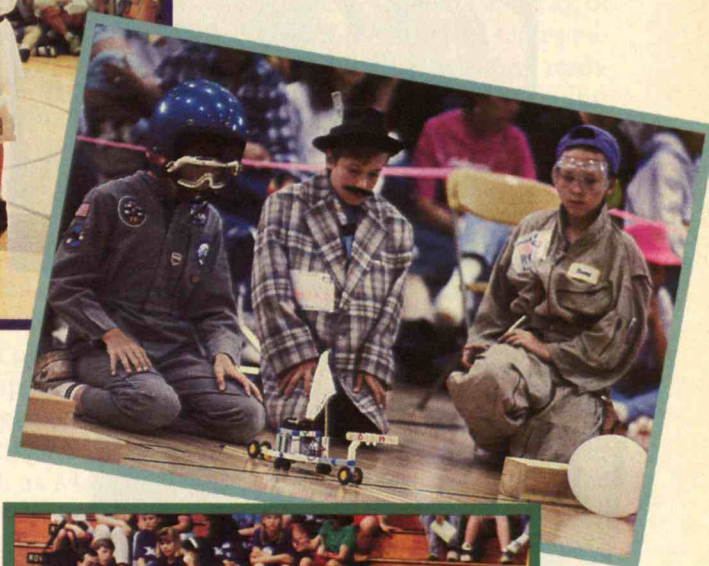
*Didn't We Learn That Last Year?*



In great part, the lack of challenge for gifted students stems from the unwillingness of schools to group students according to their abilities. The movement over the past decade to eliminate tracking—the relatively permanent (at least for the school year) placement of students into a class or group for students of a certain level—is creating special problems for high-ability students. The anti-tracking movement is based on the belief that such grouping is too often a self-fulfilling prophecy: kids labeled as “smart” flourish with stimulating instructional methods and interesting material, while those deemed “slow” stagnate in a backwater of low expectations, dulled by rote learning of basic skills.

Distaste for tracking has led to the erroneous presumption that all forms of grouping are bad. But some ability grouping is necessary for providing advanced content to high-ability students. Teachers have traditionally used some form of flexible instructional grouping to target appropriate levels of challenge and instruction for the wide range of abilities and interests in their classrooms, particularly in reading and math. Unfortunately, in their zeal for egalitarian equality, schools have turned away from ability-based grouping even within classrooms. Our survey of third- and fourth-grade classrooms found that students identified as gifted received instruction in homogeneous groups only about 20 percent of the time they were in school. This homogenization results in a “one size fits all” curriculum that is usually tailored to students in the middle of the class or, worse yet, to students who achieve at the lowest level.

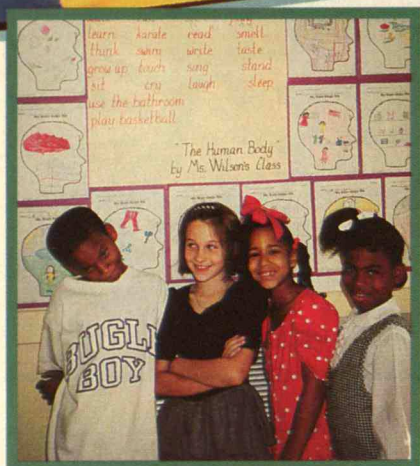
Another trend that is potentially detrimental to gifted students is cooperative learning, in which small groups of students work together on assigned classwork. In one typical form of cooperative learning, a teacher assigns one bright child, two average children and one below-average student to a group. The smart student is supposed to help the others, and, in theory, all will benefit. Teachers have employed this method for decades, and it can indeed be a sound pedagogical technique.



*Talented youngsters often find opportunities to do creative problem solving in extracurricular activities. Teams of kids participating in typical Odyssey of the Mind contests design weight-bearing structures made of lightweight material (top), build and race vehicles powered by a variety of energy sources (middle), and design a vehicle propelled by rowing for an “around the world” contest (bottom). Results can be impressive: one 18-gram structure held 1,200 pounds.*

Unfortunately, some bright students are not interested in teaching others, and some cannot explain how they've acquired advanced concepts. What's more, a student who is tutoring others in mathematics may refine some of his or her basic skills and knowledge but will not encounter the challenge necessary for the most advanced types of work.





**T**op, middle: Local universities can provide intellectual stimulation that schools do not. An Iowa State summer program gives gifted 7th-12th graders a chance to work closely with researchers. Bottom: Third graders in a mixed-ability class in Alabama use enrichment exercises originally devised for gifted youngsters. Such practices partly compensate for the absence in most schools of ability-based grouping.

Because most elementary-school classes are composed of kids with a wide range of abilities, textbooks must be written so that the less-able students at each grade level can understand them. Social studies books, for instance, now “teach” second- and third-grade stu-

dents concepts that they grasped when they were two or three years old—that people live in families, for instance, and that they buy food at a store. When California educators tried to find textbooks that would challenge the top third of their students, no publisher had a book to present. The publishers suggested instead the reissuing of books from the late sixties—damning evidence of the “dumbing down” of textbooks over the past 25 years.

Although this phenomenon first received popular attention 10 years ago in the scathing Department of Education report, *A Nation at Risk*, the trend is not new. Textbooks began their slide in the 1920s as the children of immigrant and uneducated families began entering schools in large numbers. In response to this influx, books introduced fewer and fewer new words, and the words that were introduced were repeated more often. This trend continued through the 1950s in all subject areas: reading, social studies, mathematics, and science.

How far have books fallen? Take a look at the following two excerpts. The first passage comes from a fifth-grade history book published in 1950:

*After a time Captain Jones had command of another ship, the “Bonhomme Richard.” It was an old vessel and not very strong. But in it the brave captain began a battle with one of England’s fine ships. The cannons on the two ships kept up a steady roar. The masts were broken, and the sails hung in rags above the decks. Many of the men on the “Bonhomme Richard” lay about the deck dead or dying. The two vessels crashed together, and with his own hands the American captain lashed them together. By this time the American ship had so many cannon-ball holes in its side that it was beginning to sink. The English captain shouted: “Do you surrender?” “Surrender? I’ve just begun to fight,” John Paul Jones roared back at him. It was true. The Americans shot so straight and fast that the English sailors dared not stay on the deck of their ship. Their cannons were silent. At last the English captain surrendered.*

Contrast that lively (albeit melodramatic) account with the dreary description of the same event from a fifth-grade textbook now in wide use:

*The greatest American naval officer was John Paul Jones. He was daring. He attacked ships off the British coast. In a famous battle, Jones’ ship, the “Bonhomme Richard,” fought the British ship “Serapis.” At one point in the battle Jones’ ship was sinking. When asked to give up, Jones answered, “I have not yet begun to fight.” He went on to win.*



The poor quality of textbooks would not matter so much if schools treated the books as merely one of many teaching tools. Unfortunately, that is not the case. In too many elementary schools, textbooks dominate classroom instruction, constituting 75 to 90 percent of teaching time. In effect, textbooks determine what is taught in the classroom. The result is a curriculum bogged down with repetition. Imagine the frustration of a precocious reader who enters kindergarten reading at a relatively advanced level and spends the next two years being “taught” the letters of the alphabet and beginning letter blends. That’s hardly the way to spark enthusiasm in an eager young mind.

Unfortunately, such glacial progress is the norm. Topics begun at the end of one grade are typically continued well past the beginning of the next. Overall, students in grades two to five encounter 40 to 65 percent new content, an equivalent of new material just two or three days per week. By eighth grade, this amount has dropped to 30 percent, just one and a half days per week. In mathematics, for example, popular textbooks present a steadily diminishing amount of new material each year through the elementary school years, according to studies by James Flanders, a noted mathematics researcher and elementary-school textbook editor at the University of Chicago. Instruction in addition and subtraction is repeated during every elementary school year. In Taiwan and Japan, by contrast, fifth graders study elementary algebra. In Holland, practice in multiplication and division is considered completed after third grade.

“There should be little wonder why good students, and even average or slower-than-average students, get complacent about their mathematics studies,” says Flanders. “They know that if they don’t learn it now, it will be retaught next year.” Most of the new content in any textbook, naturally, is found in the second half of the book. The result, notes Flanders, is that “earlier in the year, when students are likely to be more eager to study, they repeat what they have seen before. Later on, when they are sufficiently bored, they see new material—if they get to the end of the book.”

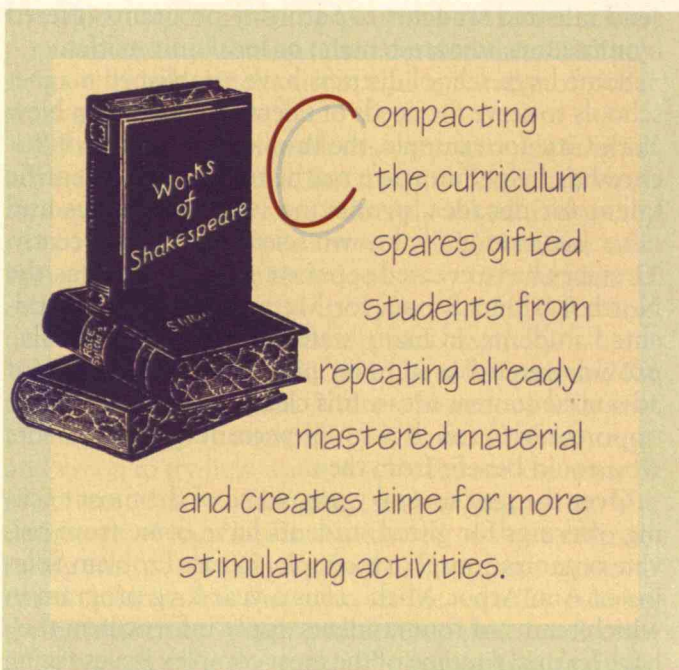
Gifted students could gain much simply from streamlining of the curriculum to reduce repetition. Such “compacting” excuses high-ability students from plowing through material that they have already mastered. A study of compacting by the National Center for the Gifted and Talented showed that teachers could eliminate as much as 40 to 50 percent of the usual material without affecting achievement scores in reading, math computation, social studies, and spelling. In fact, students whose science and math curriculum was compacted scored significantly *higher* than their counterparts in a control group given the full curriculum. Such is the benefit of relieving boredom.

## THE GUTTING OF GIFTED EDUCATION

During the 1970s and 80s, a diverse array of services arose to meet the needs of high-ability students, such as math competitions, training in the invention process, and consultations by classroom teachers with specialists in gifted education. But budget pressures, exacerbated by the lingering recession, have forced gifted education into a full-scale retreat.

The reductions affect programs in several ways. Some school districts now offer gifted programs only at certain grade levels; typically, it is the elementary-school grades that get cut first. Some districts have dropped special components such as an arts program; and others have cut personnel. In many states, the position of state director of gifted education has been scaled back; other states, such as Massachusetts, have eliminated the positions entirely. Even states with laws mandating special attention for gifted students—including, Alaska, Florida, South Dakota, Utah, and Virginia—have eliminated or put in jeopardy some 15 percent of their programs.

In states without such a mandate, such as Connecticut, Delaware, North Dakota, and Wyoming, the impact is more dramatic: one in three programs in these states were reduced or threatened with reduction in the 1991–92 academic year (the last year for which such figures are available). In one school district in Connecticut, financial constraints have reduced the gifted program staff from seven teachers to two. Resource-room time for independent study, research, and critical and creative thinking are no longer provided to middle- and high-school students; gifted elementary-school students





spend only one hour a week in a resource room catering to their special abilities. Several of the states that require services for the gifted, including Oklahoma and Alaska, are considering repeal of their mandates. And two states that had passed legislation to require gifted education—Mississippi and Maine—have postponed implementation because of lack of funding.

One parent summarized her frustrations when her son's program was cut:

*I remember my son coming home and telling me he was upset and angry because they were doing a chapter on telling time in his fourth-grade class. He learned to tell time before he entered kindergarten and he said, "I know all of this stuff. I've known all of the math work all year." And I tried to explain that other students needed to learn about time. And he was very angry and said to me, "But what about me?" And I didn't know what to say to him.*

#### PROVIDING A CHALLENGE

**D**espite these cutbacks, promising programs have become available that allow gifted and talented students to leave their regular classroom to pursue individual interests and advanced content. For example, many local districts have created innovative mentorship programs that pair a bright elementary-school student with an adult or high school student who shares a common interest. And some schools, acknowledging that they do little different for gifted students within the school day, provide after-school enrichment programs, or send talented students to Saturday programs offered by museums, science centers, or local universities.

Some large school districts have established magnet schools to serve the needs of talented students. In New York City, for example, the Bronx High School of Science has helped nurture mathematical and scientific talent for decades, producing Nobel laureates and other internationally known scientists. More recently, 11 states have created separate schools, such as the North Carolina School for Math and Science, for talented students. In many states, "governor's schools" provide intensive summer programs in a variety of advanced content areas. It is clear, however, that these opportunities touch a small percentage of students who could benefit from them.

Over the past several years, some of the most exciting offerings for gifted students have come from private organizations. For example, Future Problem Solving of Ann Arbor, Mich., runs a year-long program in which teams of four students apply information they have learned to some of the most complex issues facing

society, such as the overcrowding of prisons or global warming. At regular intervals throughout the year, the teams mail their work to evaluators, who review it and offer suggestions for improvement. The program challenges students to think, to make decisions, and to come up with unique solutions to problems. (One team in Connecticut, for example, proposed converting surplus military submarines into additional prison space.)

Although not developed solely for gifted students, Future Problem Solving is widely used in gifted programs because they typically have the inclination to pursue such additional projects. Gifted students also are more often able to afford the time for such activities, after breezing through much of their regular schoolwork. In a similar effort, called Odyssey of the Mind, teams of students design structures and machines. In one typical project, students had to design and build a balsa wood structure to support the most weight possible. Costs to the schools for these programs are modest—\$55 per student team for Future Problem Solving, \$135 for Odyssey of the Mind. For these fees, the schools receive background materials on the topic and access to the network of evaluators (typically, teachers who are coaching teams at other schools).

Another national program, operated by the Center for Talented Youth and Academic Programs at Johns Hopkins University, recruits and provides testing and program opportunities for precocious youth. Each year, Talent Search offers both the mathematics and verbal portions of the Scholastic Aptitude Test—usually taken by high-school juniors and seniors—to thousands of interested 12- to 14-year-olds (typically seventh and eighth graders). Those who score above that year's mean for college-bound seniors become eligible for a number of programs operated by Talent Search, including summer seminars in advanced subjects and enrollment in college courses. By taking advantage of the courses offered by Talent Search, a talented youth could complete two or more years of math in one year. Unfortunately, school districts do not have to honor these credits and could require a student who took geometry during a junior-high-school summer to take it again as a high-school sophomore.

Enrichment opportunities for the brightest students are not limited to math and science. To enter the annual History Day contest, students can work individually or in small groups on research projects related to a historical event, person, or invention related to a given theme. Drawing on primary source materials such as diaries, as well as information gathered in libraries, museums, and interviews, students prepare research papers, projects, media presentations, and performances as entries. The entries are judged by



local historians, educators, and other professionals; each June, state finalists compete for a nationwide prize.

While these programs are valuable supplements, the smartest kids would also benefit greatly if existing schools simply became more flexible in their assignment of children to grade levels. Why, for example, do we have or even need 12 grades that students must pass through in sequence? Why can't students progress through a series of competencies in an ungraded setting, thus earning time to pursue advanced curricula or an area of individual interest or talent?

Unfortunately, most educators these days discourage a broad range of useful, and once common, acceleration practices—starting kindergarten or first grade at a younger age, skipping grades, or entering college early. This reluctance stems from a misguided anti-intellectualism that discourages policymakers from promoting excellence in our schools and allows them to pay less and less attention to nurturing intellectual growth. Anti-acceleration policies—often justified on the social harm that the gifted student might experience—also tacitly acknowledges the anti-intellectualism of children: kids labeled as gifted have traditionally been ostracized by their peers.

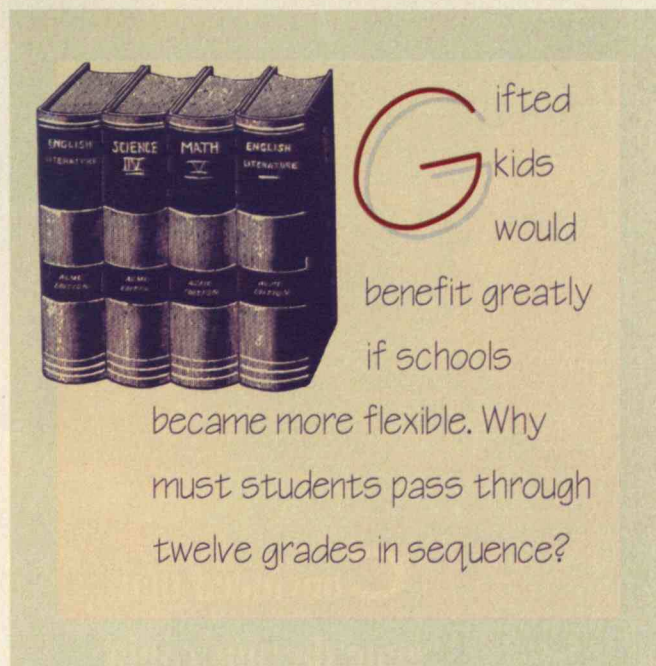
Indeed, bright students seeking to avoid harassment learn to hide their academic prowess, such as by ceasing to participate in class discussions. Consider the experiences of an exceptional student who pleaded with her school board to save the gifted program:

*In my 12 years in school, I have been placed in many "average" classes—especially up until the junior- high-school level—in which I have been spit on, ostracized, and verbally abused for doing my homework on a regular basis, for raising my hand in class, and particularly for receiving outstanding grades.*

## THE GIFTED'S GIFT TO SCHOOLS

**G**ifted programs have developed an impressive menu of curricular adaptations, independent study and thinking-skill strategies, grouping options, and enrichment strategies. Many of these innovations could be used to improve education for all students, not just those who score highly on intelligence or achievement tests. In particular, programs for teaching the gifted tend to focus not on memorizing facts but on practicing the skills of knowledge acquisition and problem solving.

In fact, most students would benefit from this approach to instruction. With knowledge accumulating at an unprecedented pace, it is at least as important to teach kids how to obtain and analyze information



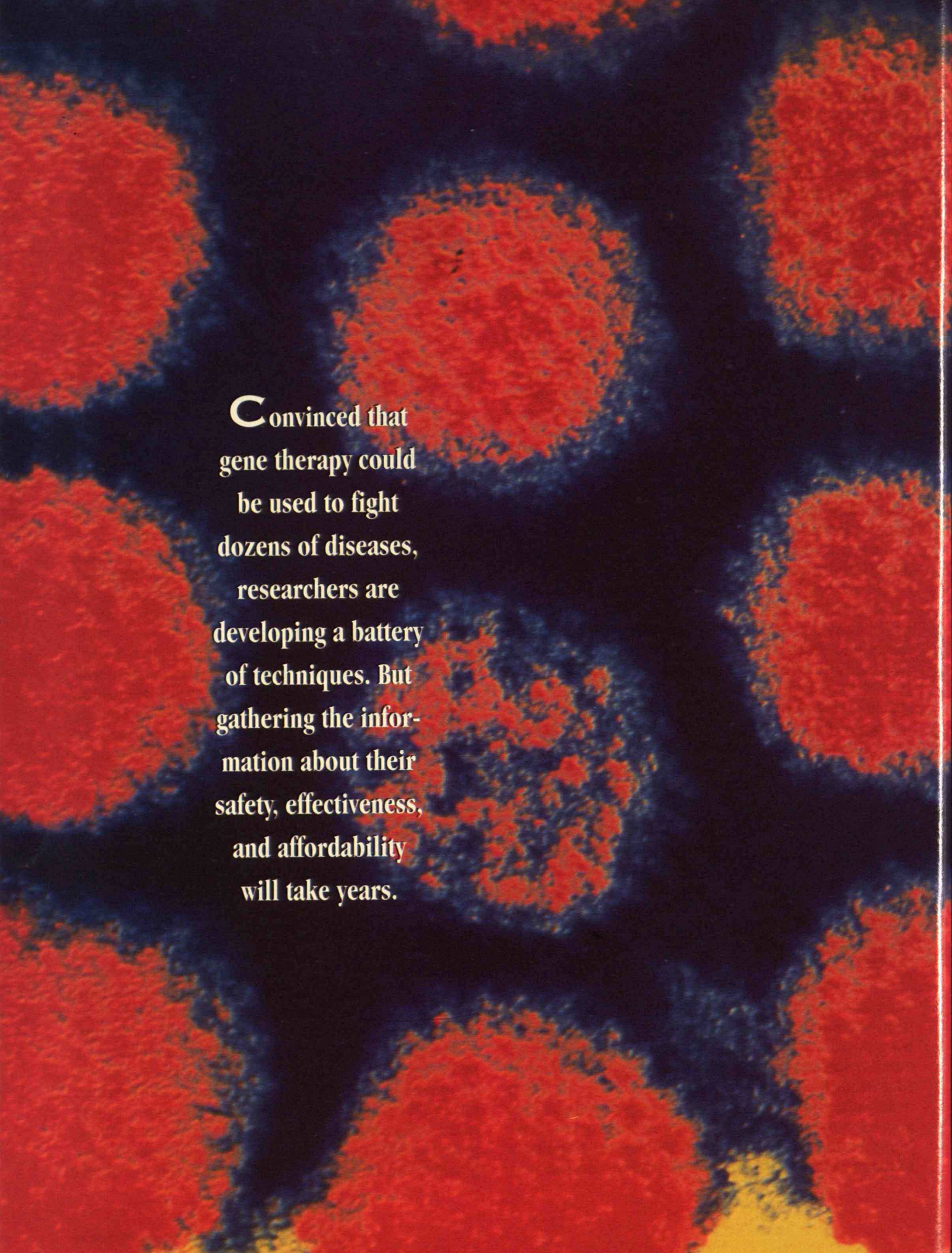
as it is to convey an existing set of facts. Educators should therefore reassess the need for content-based instruction for students of all ability levels. Bright students fortunate enough to be receiving special attention are already experiencing the joys of independent, self-directed learning. This kind of schooling is more challenging and more fun than conventional classroom work. Why not apply it more generally?

Joseph Renzulli and I at the University of Connecticut have developed an approach to do just that. Our "schoolwide enrichment model" has been field tested and implemented by hundreds of school districts across the country. This approach seeks to apply strategies used in gifted programs to the entire school population, emphasizing talent development in all students through acceleration and a variety of other strategies.

Of course, not all students can participate in all advanced opportunities. But many children can work far beyond what they are currently asked to do; they rise to the level of expectations. In addition, the infusion of some of these techniques may help us identify other young people with untapped potential for academic achievement, leadership, and creativity.

Ideas for improving education have been around for decades, if not centuries. More will undoubtedly surface as long as thoughtful people have the courage and vision to try new ways to solve the endless array of problems that a changing society places on the doorsteps of its schools. Amidst all of these restructuring efforts, we cannot afford to ignore our most talented children. It is they who set the pace. By pushing these children to stretch and develop their intellectual gifts, we can raise the standard of schooling for all. ■



A microscopic image showing several cells. The nuclei are stained a bright, textured red, while the surrounding cytoplasm and extracellular space are a deep, dark blue. The cells are roughly spherical and clustered together.

**C**onvinced that  
gene therapy could  
be used to fight  
dozens of diseases,  
researchers are  
developing a battery  
of techniques. But  
gathering the infor-  
mation about their  
safety, effectiveness,  
and affordability  
will take years.



BY MARK A. FINDEIS

# Genes to the Rescue

**P**EOPLE with cystic fibrosis, one of the most common lethal hereditary diseases, usually die early in adulthood unless they undergo a lung transplant. During the last year several laboratories in the United States and Britain have begun experiments to treat the disease, which afflicts 30,000 Americans, by transferring into patients' airways copies of a critical gene that they lack. The theory is that, if the gene can enter the cells lining the lungs, that should allow the cells to produce the critical protein that cystic fibrosis patients cannot make themselves. ♦

In a recent report on such a gene-therapy effort, Michael J. Welsh, a professor of internal medicine at the University of Iowa College of Medicine and an investigator at the Howard Hughes Medical Institute, has shown that cystic fibrosis patients have been able to produce—albeit in minute quantities—the critical protein. Although Welsh's research was designed to examine the safety of his particular technique rather than to alleviate patients' medical problems, it has nevertheless raised hopes that cystic fibrosis could someday be treated by gene therapy. ♦

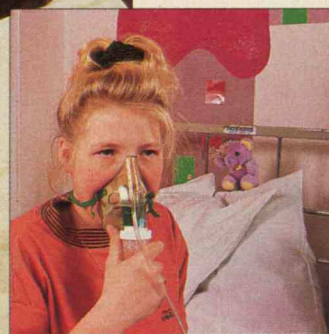
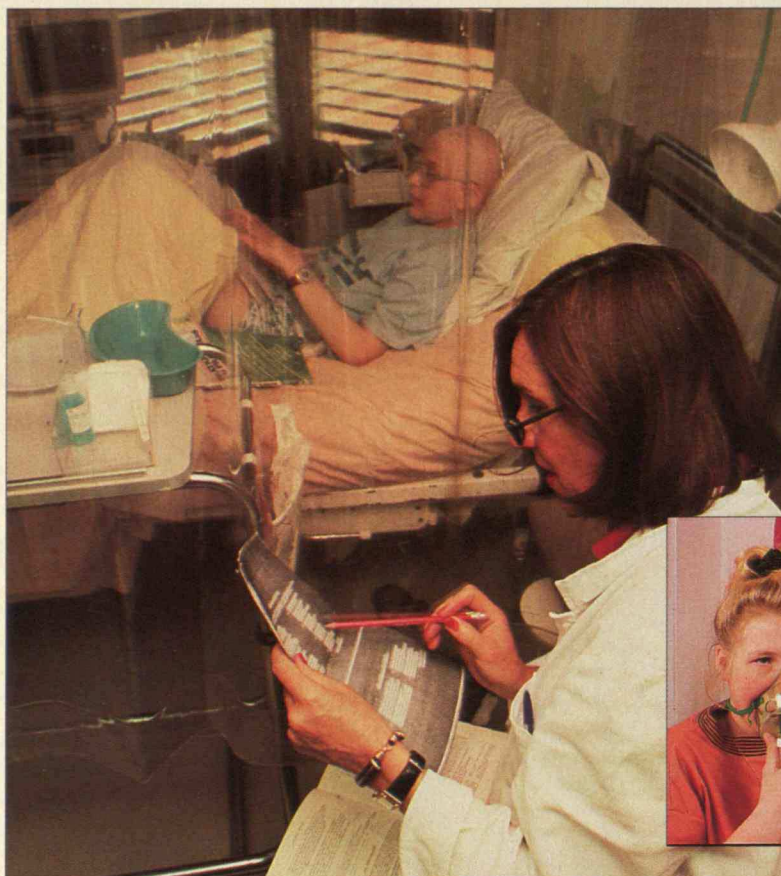
Research on gene therapy has grown dramatically in just a few years. The National Institutes of Health's Recombinant DNA Advisory Com-

♦ ♦ ♦  
BACKGROUND PHOTO: RESEARCHERS HAVE INSERTED A THERAPEUTIC GENE FOR CYSTIC FIBROSIS INTO ADENOVIRUS PARTICLES, SUCH AS THOSE SHOWN HERE, AND THEN PLACED THE RESULTING "VECTOR" INTO PATIENTS' LUNGS.

PHOTO: CUSTOM MEDICAL STOCK



**R**IGHT: THE FIRST HUMAN GENE-THERAPY EXPERIMENT ENTAILED TREATING A CHILD WITH SEVERE COMBINED IMMUNODEFICIENCY DISEASE, WHICH ORDINARILY RESULTS IN DEATH FROM INFECTION. THE THERAPY HAS ENABLED THE CHILD TO ATTEND SCHOOL INSTEAD OF LIVING IN A STERILE ENVIRONMENT LIKE THIS. FAR RIGHT: IN THE PAST YEAR EXPERIMENTS HAVE RAISED HOPES THAT GENE THERAPY COULD SOMEDAY BE USED TO TREAT CYSTIC FIBROSIS, ALLEVIATING SUFFERING ENDURED BY 30,000 AMERICANS.



mittee, which reviews federally funded therapeutic gene-transfer experiments, has approved more than 40 such protocols on humans since the first trial in 1990. At the time, W. French Anderson, then chief of the molecular hematology branch at the National Heart, Lung, and Blood Institute; R. Michael Blaese, deputy chief of the metabolism branch at the National Cancer Institute (NCI); and Kenneth W. Culver, then a senior clinical investigator in NCI's metabolism branch, treated a girl with severe combined immunodeficiency disease, which ordinarily results in childhood death from overwhelming infection. The immune systems of that patient and another girl who periodically receives gene therapy for the disease have subsequently improved so much that they can now attend public school.

There is even some commercial activity. At least 18 companies have become directly involved in gene-therapy research and development. But almost all of the human trials have involved only single or a few individuals at a time, and most researchers have not yet published results. Despite widespread news reports, in fact,

*MARK A. FINDEIS, a group leader at OsteoArthritis Sciences in Cambridge, Mass., previously worked in gene-therapy research at TargeTech in Meriden, Conn. He has been an instructor at Harvard Medical School and a postdoctoral fellow in the Bioorganic Chemistry and Biochemistry Laboratory at the Rockefeller University.*

few results from human trials are yet available. Much of the work is still trying to establish the safety of experimental protocols.

Still, given positive results in animal models, many researchers believe that gene transfer potentially could be used someday to combat perhaps dozens of serious human diseases caused by genetic mutations, including sickle-cell anemia, emphysema, hemophilia, and a malady marked by extremely high levels of cholesterol. For some diseases, gene therapy might provide the first effective treatment. For those genetic diseases that can already be treated, gene therapy could be better than what is now the top-of-the-line technique: providing patients with essential proteins, such as insulin for diabetics. Such treatment isn't always ideal. Because of the cost of purified clotting factor, for example, hemophiliacs usually take that protein only after bleeding begins, risking damage to joints by the delay.

Inserting genes that stimulate the production of immune cells might also help fight cancer. Although the number of patients involved in anticancer gene-therapy trials is small, well over half of today's gene-transfer experiments on humans are devoted to combatting cancers. Researchers are also trying to develop gene therapies for hepatitis and other liver diseases, AIDS, and diseases of the cardiovascular and central nervous systems.



## The Most Common Gene-Therapy Technique

The first clinical gene-therapy trials—and the majority of those now under way—depend on a viral “vector,” a viruslike particle into which researchers have placed a therapeutic gene. Clinicians introduce the vector to cells that have been removed from a patient and are growing and dividing in culture, and the vector transfers the therapeutic gene into the cells’ chromosomes (large pieces of DNA into which the cells’ genes are organized). Researchers later return these “transfected” cells to the body, and the molecular machinery inside the cells that reads chromosomal information begins making the needed protein. In principle, the therapeutic gene can remain in the patient’s chromosomes as long as the cells stay alive in the body.

The virus employed in these “ex-vivo” experiments is a mouse retrovirus. Researchers use retroviruses because, after entering cells, those take advantage of processes that occur during cell division to introduce viral genetic material permanently into the cells’ chromosomes. In this way, a therapeutic gene is reproduced with the chromosomes when the cell divides.

The ex-vivo viral-vector strategy raises some safety concerns, although the vectors do not contain all of a retrovirus’s genes and therefore should not be able to reproduce and cause a viral infection. Safe vectors are technically difficult to produce; scientists have to be careful that parent virus able to cause disease does not contaminate batches of modified vector. The possibility of developing cancerous cells is another worry with retroviruses. In the process of being integrated into a patient’s chromosomes, a new gene may interfere with a normal one, since retroviruses insert their genes into chromosomes indiscriminately. While the chances are low, if a region of a chromosome that regulates cell growth was affected, the patient’s cells might conceivably become cancerous and one disease might be cured at the expense of causing another. Researchers may need more than a decade to see if the few viral genes employed cause cellular changes other than the production of a therapeutic protein.

The costs associated with ex-vivo gene therapy could also prove formidable in some cases. In a common approach to gene therapy for long-term treatment of familial diseases, for example, doctors harvest the patient’s bone-marrow cells and treat them with a retroviral vector. (Such cells, unlike most in the body, are rapidly dividing and, since that is a necessary condition for retroviruses to insert genetic material, are useful candidates for retroviral vectors.) This procedure, similar to that used for a bone-marrow transplant, might cost up to \$150,000. In some cases the surgery might have to be repeated (and costs commensurately

increased), since the research so far—which is still quite limited—indicates that retroviral gene transfer sometimes modifies only 10 percent of treated cells, and more than that may be required. Also, protein production may stop entirely after several weeks, for as yet unknown reasons.

To raise and maintain the levels of protein manufacture, researchers are trying to manipulate particular DNA sequences that lie adjacent to therapeutic genes. Through a series of steps, these sequences—called promoters and enhancers—boost protein production. Work involving these sequences remains experimental at this point.

## Newer Gene-Therapy Techniques

Some researchers are devising different approaches to gene therapy, although most of these have not yet made it to the clinical-trial stage. An approach employing another viral vector—one derived from adenovirus, which causes the common cold—is what Welsh’s team at the University of Iowa, as well as researchers at the University of Pennsylvania and the National Institutes of Health, have been using, or expect to use, to transfer the therapeutic gene into cystic fibrosis patients. Adenovirus is attractive partly because it can insert its genes into non-dividing cells, which make up most of the body. This could eliminate the expense of conducting surgery along the lines needed to remove bone marrow. (For the experimental cystic fibrosis therapy, clinicians have simply dripped or sprayed modified adenovirus into a patient’s lungs. The vector then inserts the critical gene into lung cells.) Moreover, cellular chromosomes do not incorporate adenovirus genes, lowering concerns that those genes could lead to unrestrained cell growth and cancer.

Still, researchers have a long way to go before they fully understand the value of this gene-therapy approach. The treatment would have to be administered repeatedly, since the airway cells targeted by adenovirus have lifetimes of only a month or so. And scientists have not yet tested adenovirus-derived vectors to know whether the needed gene prompts patients to produce therapeutic amounts of protein, although researchers expect about 10 percent of the airway cells to be transfected. It is also not clear whether a certain amount of adenoviral vectors will have side effects. Last year one of three cystic fibrosis patients being treated with an adenoviral vector at the National Institutes of Health experienced fever, lung inflammation, and reduced levels of oxygen in the blood. The affected patient, who was receiving a higher dose of modified virus than her cohorts, recovered from the problems after researchers stopped the experiment. They decided



## GENE THERAPIES APPROVED FOR HUMAN TESTING BY THE NATIONAL INSTITUTES OF HEALTH

INVESTIGATOR/INSTITUTION	DISEASE	YEAR APPROVED
R. MICHAEL BLAESE, NATIONAL CANCER INSTITUTE (NCI)	SEVERE COMBINED IMMUNE DEFICIENCY	1990
STEVEN A. ROSENBERG, NCI	CANCER (THREE TREATMENTS)	1990-1991
JAMES M. WILSON, UNIVERSITY OF PENNSYLVANIA	FAMILIAL HYPERCHOLESTEROLEMIA (VERY HIGH CHOLESTEROL)	1991
GARY J. NABEL, UNIVERSITY OF MICHIGAN	MALIGNANT TUMORS	1992
SCOTT M. FREEMAN, TULANE UNIVERSITY MEDICAL CENTER	CANCER	1992-1993
MALCOLM K. BRENNER ET AL., ST. JUDE CHILDREN'S RESEARCH HOSPITAL, MEMPHIS	NEUROBLASTOMA (TUMOR OF ADRENAL GLANDS OR SYMPATHETIC NERVOUS SYSTEM)	1992
EDWARD OLDFIELD, NATIONAL INSTITUTE OF NEUROLOGICAL DISORDERS AND STROKE (NINDS)	BRAIN TUMORS	1992
BERND GANSBACHER ET AL., MEMORIAL SLOAN KETTERING CANCER CENTER, NEW YORK	MELANOMA	1992
BERND GANSBACHER ET AL., MEMORIAL SLOAN KETTERING CANCER CENTER, NEW YORK	ADVANCED KIDNEY CANCER	1992
MICHAEL T. LOTZE AND JOSHUA T. RUBIN, UNIVERSITY OF PITTSBURGH	CANCER	1992-1993
RONALD G. CRYSTAL, NATIONAL HEART, LUNG AND BLOOD INSTITUTE (NHLBI)	CYSTIC FIBROSIS	1992-1993
JAMES M. WILSON, UNIVERSITY OF PENNSYLVANIA	CYSTIC FIBROSIS	1992-1993
KENNETH W. CULVER, IOWA METHODIST MEDICAL CENTER, AND JOHN C. VAN GILDER, UNIVERSITY OF IOWA	MALIGNANT BRAIN TUMORS	1993
JONATHAN SIMONS, JOHNS HOPKINS ONCOLOGY CENTER	KIDNEY CANCER	1993
ROBERT W. WILMOTT AND JEFFREY WHITSETT, CHILDREN'S HOSPITAL MEDI- CAL CENTER, CINCINNATI, AND BRUCE TRAPNELL, GENETIC THERAPY, GAITHERSBURG, MD	CYSTIC FIBROSIS	1993
RICHARD C. BOUCHER AND MICHAEL R. KNOWLES, UNIVERSITY OF NORTH CAROLINA	CYSTIC FIBROSIS	1993

that they would use lower doses in future work.

Another technique that has recently been tried is much simpler than the ex-vivo method: several researchers have directly injected naked genes into body cells and observed their expression as different proteins. But the research suggests that the genes work their way only into cells adjacent to the injection site. Probably too many injections would be required to have a therapeutic effect.

Still, this approach should prove useful for another medical goal: vaccinations, in which the aim is to develop an immune response. In general, a small

amount of protein production elicits this reaction. Therefore, the vaccination of animals, including humans, requires only a limited number of injections. Moreover, vaccinating with genes rather than inactivated pathogens or pathogen-derived proteins (the present methods) may be superior since the genes can maintain a low level of protein production for a prolonged period. This could yield an improved immune response, at lower cost.

Meanwhile, an injection approach that shows more promise for treating diseases entails the use of proteins that bind to "receptors" on cell surfaces. Following



INVESTIGATOR/INSTITUTION	DISEASE	YEAR APPROVED
HILLIARD F. SEIGLER, DUKE UNIVERSITY MEDICAL CENTER	MALIGNANT MELANOMA	1993
ALBERT B. DEISSEROTH ET AL., UNIVERSITY OF TEXAS M.D.ANDERSON CANCER CENTER	OVARIAN CANCER	1993
GARY J. NABEL, UNIVERSITY OF MICHIGAN MEDICAL CENTER	CANCER	1993
JOHN A. BARRANGER, UNIVERSITY OF PITTSBURGH	GAUCHER'S DISEASE	1993
STEFAN KARLSSON AND CYNTHIA DUNBAR, NINDS, AND DONALD B. KOHN, CHILDRENS HOSPITAL LOS ANGELES	GAUCHER'S DISEASE	1993
JEFFREY E. GALPIN, UNIVERSITY OF SOUTHERN CALIFORNIA, AND DENNIS A. CASCIATO, UNIVERSITY OF CALIFORNIA AT LOS ANGELES	ASYMPTOMATIC HIV INFECTION	1993
GARY J. NABEL, UNIVERSITY OF MICHIGAN MEDICAL CENTER	AIDS	1993
ROBERT SOBOL AND IVOR ROYSTON, SAN DIEGO REGIONAL CANCER CENTER	BRAIN CANCER	1992-1993
COREY RAFFEL, CHILDRENS HOSPITAL LOS ANGELES, AND KENNETH W. CUL- VER, IOWA METHODIST MEDICAL CENTER	RECURRENT PEDIATRIC BRAIN TUMORS	1993
CHARLES HESDORFFER AND KAREN ANTMAN, COLUMBIA UNIVERSITY COLLEGE OF PHYSICIANS AND SURGEONS	ADVANCED CANCER	1993
JOSEPH ILAN, CASE WESTERN RESERVE UNIVERSITY SCHOOL OF MEDICINE AND UNIVERSITY HOSPITALS OF CLEVELAND	BRAIN TUMORS	1993
PETER CASSILETH ET AL., UNIVERSITY OF MIAMI, AND NIRAMOL SAVARAJ, MIAMI VETERANS ADMINISTRATION HOSPITAL	LUNG CANCER	1993
JOYCE O'SHAUGHNESSY, NATIONAL CANCER INSTITUTE	POST-CHEMOTHERAPY BREAST CANCER	1993
LARRY E. KUN ET AL., ST. JUDE CHILDREN'S RESEARCH HOSPITAL, MEMPHIS, AND EDWARD H. OLDFIELD, NINDS	RECURRENT PEDIATRIC BRAIN TUMORS	1993
JAMES S. ECONOMOU AND JOHN A. GLASBY, UNIVERSITY OF CALIFORNIA MEDI- CAL CENTER, LOS ANGELES	MELANOMA	1993

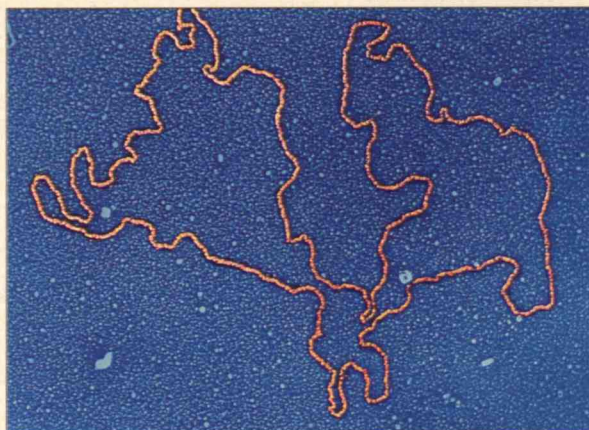
**T**HE NATIONAL INSTITUTES OF HEALTH HAS PERMITTED RESEARCHERS RECEIVING ITS FUNDS TO CONDUCT MORE THAN TWO DOZEN HUMAN GENE-THERAPY EXPERIMENTS DESIGNED TO COMBAT MANY ILLNESSES. APPROVAL REQUIRES SIGN-OFF BY THE RECOMBINANT DNA ADVISORY COMMITTEE AND THE NIH DIRECTOR. THE U.S. FOOD AND DRUG ADMINISTRATION ALSO HAS TO APPROVE ALL SUCH RESEARCH.

injection of a complex consisting of such proteins and a plasmid—a circular bit of DNA produced in bacteria—into which a therapeutic gene has been inserted, receptors carry the DNA inside the cells. George Wu, associate professor of gastroenterology at the University of Connecticut Health Center, has pioneered this research by mixing plasmids including therapeutic genes with proteins that bind to a receptor located on liver cells. For instance, in 1992 with James Wilson, then an associate professor of internal medicine and biological chemistry at the University of Michigan, Wu transferred to rabbits a complex involving a gene whose corre-

sponding protein lowers circulating levels of low-density lipoprotein, or “bad cholesterol.” The protein works by absorbing the cholesterol in the liver, where it is metabolized. A single transfer of the gene lowered the animals’ bad cholesterol levels for a week. TargeTech, my former employer, is now developing Wu’s technique commercially.

Wu’s approach is appealing





**O**NE GENE-THERAPY APPROACH INVOLVES INJECTING A COMPLEX CONTAINING PROTEINS AND A PLASMID (ABOVE)—A BIT OF DNA PRODUCED IN BACTERIA. A THERAPEUTIC GENE HAS BEEN INSERTED INTO THE PLASMID, WHICH ENTERS CELLS AFTER THE PROTEINS BIND TO THEM.

partly because the complex of proteins, plasmid, and therapeutic gene is easier to produce than retroviral vectors. The bacteria that produce the plasmid are relatively simple to grow in large quantities through fermentation, and blood plasma from donors can be the source of at least one of the proteins that can be used. Also, tests have indicated that the receptor absorbs as much as 80 percent of the DNA-protein complex from circulating blood within five minutes. Therefore the blood, which has enzymes that break down genes, has little time to degrade the therapeutic gene. Moreover, the liver is a good site to receive therapeutic genes because that is where many genes are "expressed" into proteins. Delivering a gene through

retroviral therapy to the liver is not a good idea because liver cells don't normally divide, and they can be difficult to grow in culture before being returned to a patient.

But introducing genes to cells through receptors has limitations. For reasons that aren't yet completely clear, the resulting protein production can be minimal and usually lasts only several days to a week. Both Wu and Max Birnstiel, director of the Research Institute of Molecular Pathology in Vienna, Austria, have tried remedial techniques in animals. One approach has been to add to the complexes inactivated viruses or viral surface proteins. Unlike viral vectors, these viral components do not carry the therapeutic gene. Rather, their job is simply to help in opening the cell membrane. The researchers' hunch that this would allow the gene to pass more easily into the cell and hence make it available

for greater levels of expression appears correct: various reports suggest that the level of protein production can be raised many times. Scientists have also prolonged gene expression for at least three months in rats using a chemical compound that stimulates liver metabolism.

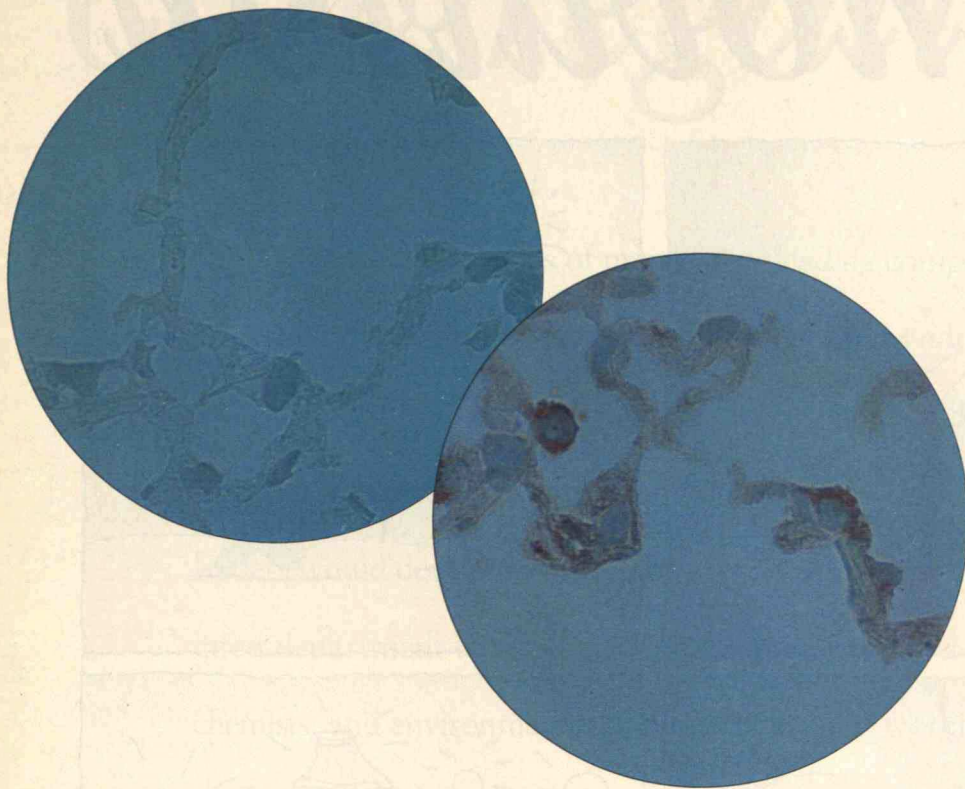
One of the most immediately promising gene-therapy approaches has been developed by Robert Debs, associate research physician, and coworkers at the Cancer Research Institute of the University of California at San Francisco, who have sprayed an aerosol into the lungs of mice. The aerosol attaches the gene that produces the protein for counteracting cystic fibrosis to a positively charged lipid mixture—a fatty material similar to others used in drug delivery. The material brings the gene to the surface of a cell by electrostatically binding to its outer membranes. Then, as the positively charged lipids mix with other lipids in the membrane, the gene can enter the cell. After a single 90-minute inhalation, Debs could still see gene expression above normal background levels in most of the airway cells 60 days later.

There is so far no clear indication of a downside to Debs's approach, although the procedure has yet to be tried in humans. While the lipid mixture is relatively expensive to use in the small amounts needed for research, if it were produced on a larger scale its cost would probably be low compared with the price tag for introducing therapeutic genes by means such as viral vectors. In large quantities, the positively charged lipids are toxic, but since very low amounts would be needed the approach should be safe. At this point, MEGABIOS Corp. of San Francisco is developing Debs's technique further.

Yet one more approach related to gene therapy is on the horizon today. Called "antisense," this method attempts the opposite of what the other techniques do: it aims to turn *off* genes that code for the production of harmful proteins. For example, Robert D. Rosenberg, a professor of biology at MIT, is testing a technique to stop the manufacture of a protein that normally helps promote the development of cells responsible for narrowing coronary arteries months after balloon angioplasty. (See "A New Way to Keep the Heart's Arteries Open," *TR* November/December 1993.)

Antisense researchers use analogs of DNA sequences or short pieces of DNA called oligonucleotides as drugs to target a gene sequence. The compounds, which are complementary to key sections of a gene, bind to it, thereby interfering with its expression. Another technique is to use ribozymes, sequences of the genetic material RNA that cleave the nucleic acids found in genes. Ribozymes can be engineered to bind to specific nucleic acid sequences, cutting them and ruining their ability to instruct for the synthesis of proteins.





**A**NOTHER TECHNIQUE  
ENTAILS SPRAYING AN  
AEROSOL CONTAINING A  
THERAPEUTIC GENE  
ATTACHED TO A POSITIVELY  
CHARGED MATERIAL. AFTER  
THIS MATERIAL BINDS TO  
BODY CELLS, THE GENE CAN  
ENTER THEM. A PROTEIN  
EXPRESSED BY THE ADDED  
GENE SHOWS UP CLEARLY  
IN AN IMAGE OF LUNG  
CELLS (RIGHT), IN CON-  
TRAST TO UNTREATED  
LUNG CELLS LACKING THE  
GENE (LEFT). THIS TECH-  
NIQUE IS BEING TESTED  
IN CYSTIC-FIBROSIS  
PATIENTS IN ENGLAND.

But it's difficult to deliver enough antisense agents to the particular cells where they need to act because they often decompose quickly in the body. In general, therefore, the agents need to be administered in quantities high enough that they may be toxic. Targeting techniques may deliver the compounds more effectively to specific areas. To inhibit hepatitis B infection in the liver, for example, TargeTech has injected woodchucks with a complex containing an antiviral oligonucleotide and a protein that binds to liver cell receptors. (Woodchucks develop a form of hepatitis B similar to the human form and are therefore used as a model for the disease.) Researchers have found that the approach, which was supposed to stop a gene in the hepatitis B virus that coopts the liver to make copies of the virus, successfully lowered the level of virus in the woodchucks for several days. Preclinical testing continues.

### Limits and Hopes

At least some of these techniques should eventually offer safe, effective, and affordable treatments, but gene therapy is not likely to prove useful against all genetic diseases. Some, such as hypertension, gout, and diabetes, would appear difficult to treat because they involve multiple genes. And some diseases pose problems because the genes require regulation and therefore patients need varying amounts of a protein at different times. The amount of insulin required by diabetics, for

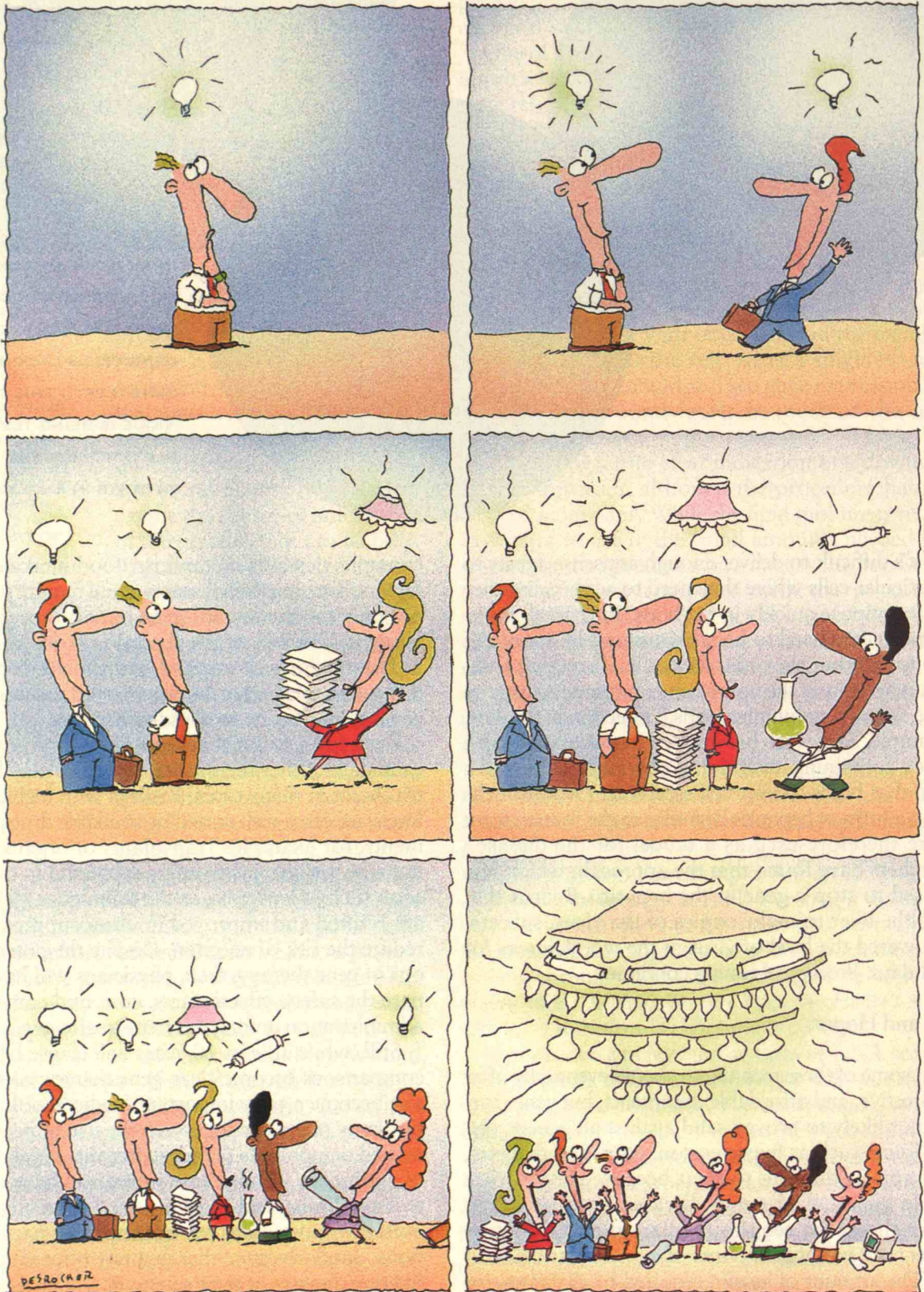
example, depends on exercise, food intake, and other factors. Treating such diseases could require transferring not only the therapeutic gene but also the genes regulating it. Diseases of the central nervous system, such as Huntington's chorea and Alzheimer's, could also be difficult to treat, since doing so would require delivering genes to the brain—not a simple matter.

Even for diseases that seem like prime gene-therapy candidates, other therapeutic strategies may be the better choice in many cases. Patients with high cholesterol levels are often well served by available drugs and treatments, for example. Transplants of organs and bone marrow are also increasingly successful in treating diseases such as leukemia, as the techniques for that work are refined and improved immunosuppressive drugs reduce the risk of rejection. Despite the potential glamour of gene therapy, then, physicians will have to compare the safety, effectiveness, cost, and convenience of administration among different treatments.

Still, while at least 10 years will elapse before those comparisons become clear, gene therapy could eventually become a truly important medical tool. The situation may prove analogous to the use of penicillin and related compounds decades after the initial discoveries of antibiotics. While those substances have turned out to have limits and must be used correctly, they are indeed wonder drugs for treating most bacterial infections. Similarly, gene therapy may offer much hope in fighting diseases at their source. ■



# *Innovation*



ILLUSTRATIONS BY JACK DESROCHER



# Congregations

**L**IKE creative units of many other leading companies, Monsanto's agricultural products division has adopted a new way of innovating. Gone are the days when the company followed the traditional "assembly-line" model, in which project leaders would develop products by shepherding ideas from one isolated department to the next. Since September 1992, biologists, chemists, and environmental scientists have been working shoulder to shoulder with toxicologists, manufacturing engineers, regulatory-affairs experts, and employees from units such as packaging, marketing, and sales. This approach, sometimes referred to as "concurrent development," employs a group to simultaneously perform several of the product-development tasks that used to be done one at a time and in isolation. \* Steven Lehrer, director of planning

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New-product development through "intrapreneurial" teamwork has begun to prove its worth, but there are still a few bugs.

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BY TOM KIELY



for the agricultural unit's new-product group, which is using this method to develop products such as an herbicide to protect corn, explains that in the past, when departments remained separated, "project managers had to run around to all of them and jump up and down on tables to try to get things done." A delay in one test meant that project managers had to renegotiate later steps along the project-development assembly line, often causing many more delays. Departments today have a greater understanding of the interconnections of their work schedules. Team members can juggle schedules for the benefit of the project and, in their departments, can make certain that those schedules are adhered to.

At Amgen, a biotech company in Thousand Oaks, Calif., teams change composition as a product passes through clinical trials and into the market. Research scientists dominate the groups during the earliest stages of a new drug's development, but many are replaced by specialists in other areas, such as biostatistics, manufacturing, packaging, marketing, and finance, as work progresses. Meanwhile, the project leader of the mutable team manages the overall effort and fights on behalf of the group for internal corporate resources, staff, and information.

Robin Campbell, associate director of product development at Amgen, reports that this innovation process has allowed the company to develop products in record time. For example, Neupogen, a drug used in chemotherapy, made it from the laboratory to final approval by the Food and Drug Administration in just 6 years, considerably less than the industry average of 10 to 12 years.

US West's marketing-resources group has taken another approach, not only teaming up employees from different departments but also working with subcontractors, a corporate partner, and potential customers. One resulting product, called CityKey, is an interactive

system that allows travelers to use their hotel-room television and a remote controller to browse through a wealth of information, from in-house hotel services to city maps, museum schedules, and local shopping and restaurant guides. CityKey was developed in just 12 months—about one-third the time it would have taken if all the work had remained in-house.

A team of employees drawn largely from the company's research lab, marketing and sales department, and finance operations, spearheaded the effort. But US West also signed up Spectradyn, which sells hotel television systems, and subcontracted some of the software development and video production. Finally, the company involved potential customers—hotels—in the project.

Those who have tried the group approach to innovation in different companies cite other advantages besides speed. The assembly-line style of innovation "is not only a serial process; it is also iterative," says John Mayo, president of AT&T Bell Laboratories. "One department may hand off the project to another, but months later it's back again." Besides delaying the project, this "builds in cost."

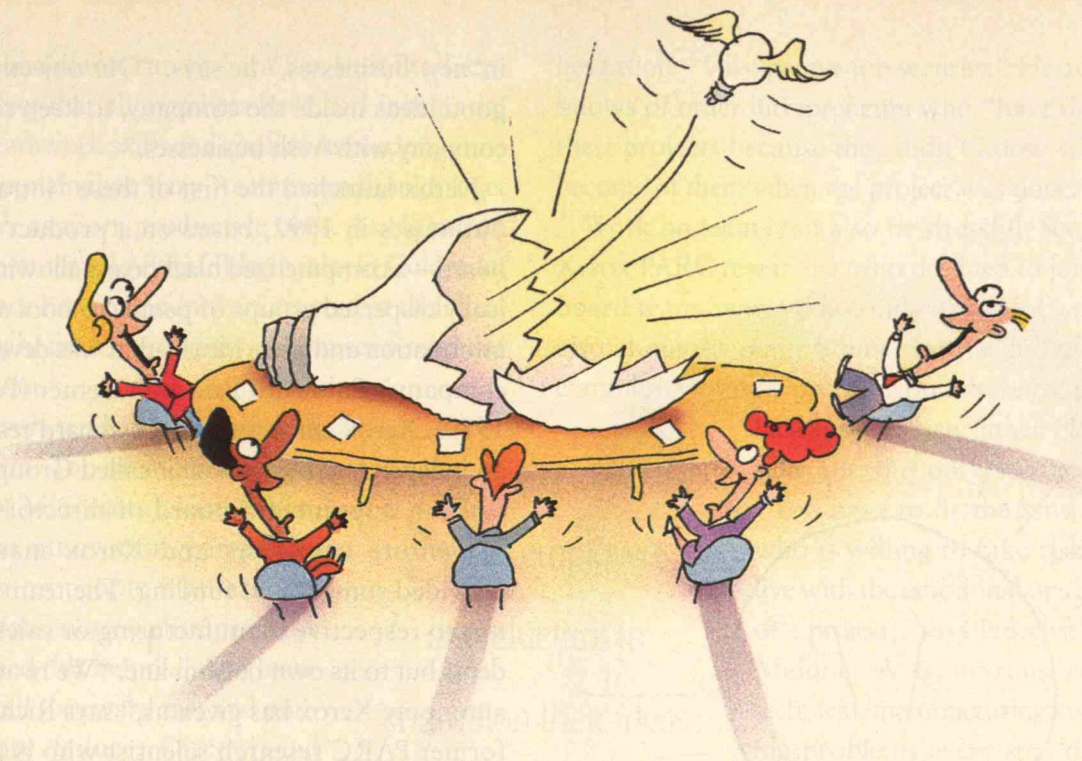
And Robert Grant, vice-president of new-product ventures for US West's marketing-resources group, points out that many managers now believe concurrent development improves the quality of new ideas themselves. Working in groups, employees trade more information than ever before—a cross-pollination that often sparks unique ideas for products or ways to improve work processes.

Some experts argue that innovation has always been, or should have been, a team effort. Americans tend to romanticize inventors such as Thomas Edison, convinced that innovations are hatched by lone geniuses, says Andrew Van de Ven, Vernon Heath professor of organizational innovation and change at the University of Minnesota's Carlson School of Management. But, he points out, most successful inventions result from the contributions of many people. Even Edison, Van de

**E**mployees trade more information working in groups—a cross-pollination that often sparks unique ideas for products.

*TOM KIELY is a Technology Review contributing writer and a senior editor at CIO, a technology-management magazine for senior executives.*





Ven notes, depended upon the efforts of his colleagues.

Still, as managers and staff embrace the team approach to innovation and experiment with different strategies, they are facing a range of challenging problems, from determining which ideas are worthy of developing to ensuring that the individuals involved don't get derailed from career tracks.

### Freedom to Champion an Idea

Team members drawn from different departments wear two corporate hats, and their commitments to the group and the department may conflict. They may at times be more keen to negotiate the best deal for their long-term constituencies than to pledge allegiance to a separate project. In a bid to avoid these problems, Hoechst Celanese and Xerox Corp. are experimenting with more radical alternatives—permanently removing team members from their departments altogether and allowing them space and resources to innovate.

At Hoechst Celanese, this disengagement from traditional departments starts by reinventing the role of the team leader. Employees in the company's research operations in North Carolina and New Jersey are encouraged to look constantly for new product ideas. When they come up with one, their job is to flesh it out themselves rather than pass it along to management as a suggestion. Employees are also given the time (and some-

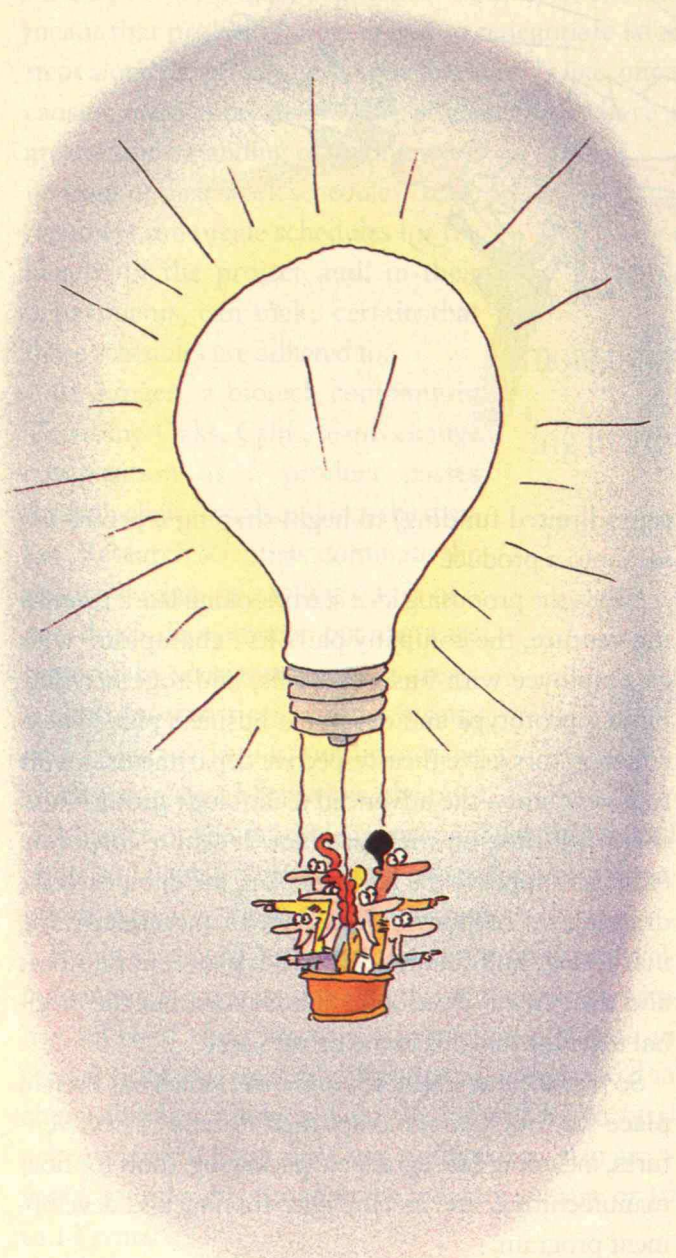
times limited funding) to begin shaping a promising idea into a product.

When the promising idea starts looking like a promising venture, the company pairs its "champion" with an employee with business skills, and together they build a prototype and develop a business plan. These collaborators leave their respective departments, report to a new unit—the advanced technology group—and work full-time on their product. If senior corporate managers approve the business plan, the duo proceeds, drawing on corporate resources for manufacturing, marketing, and finance. The team grows in numbers and diversity as development advances, but the original inventor remains in the driver's seat.

So far Hoechst Celanese's initiative, which has been in place for four years, has sparked dozens of new ventures, including biodegradable packaging, tools for fiber manufacturing, and an employee training and development program.

Xerox Corp. has gone a step further, allowing teams of product champions to become entrepreneurial companies within the larger organization. It has even set up a unit to act as an incubator of these new businesses. Roger Levien, vice-president of technology and marketing development, notes that in the past many employees have left Xerox to found successful spin-off companies. "What we're trying to do now is to 'spin-





in' new businesses," he says. "Our objective is to keep good ideas inside the company, to keep renewing the company with fresh businesses."

Xerox launched the first of these "intrapreneurial" businesses in 1992, based on a product called Liveboard—a computerized blackboard allowing geographically dispersed groups of people to pool and organize information and trade ideas—that was developed by the company's Palo Alto Research Center (PARC) in the 1980s. Xerox christened the Liveboard research group an independent business unit called Group Communications, appointed a board of directors composed of venture capitalists and Xerox managers, and provided some initial funding. The team is beholden not to respective manufacturing or sales vice-presidents but to its own bottom line. "We're amazed at the autonomy Xerox has given us," says Richard Bruce, a former PARC research scientist who is president of the new venture.

### Trouble in Paradise

Susan Cohen, an organizational performance analyst at the University of Southern California Center for Effective Leadership, recently completed a study of 170 teams in 11 companies. While many employees thrive when freed from their usual routine, she notes, teams are still largely terra incognita as a management tool. Neither managers nor business experts fully understand the multiple factors that make one effective and another a failure.

The stumbling blocks are as varied as company circumstances and teamwork strategies. For example, at Amgen, where the composition of a product team changes over time, continuity can be a bear: as people come and go, information often falls between the cracks, and new team members unknowingly duplicate the work of former members. At US West, on the other hand, product-development teams with stable membership have become so intently focused on their pursuit that they are oblivious to the work of other teams. Again, the result has been duplication of effort.

Team chemistry can also be tricky. Consider the problems that can occur when employees receive compensation based upon their team's performance. At several



North Carolina plants run by Sara Lee Knit Products, despite the fact that all members have had substantial training in teamwork skills and conflict resolution, some members complain that “lazy” teammates shouldn’t get the same pay as more productive ones. At Hamilton Standard Commercial Aircraft Electronics in Colorado, managers once had to rein in workers so that their zeal to work long hours for productivity bonuses would not lead to burnout.

Certain errors tend to be repeated, in firm after firm. Too often, charges the University of Minnesota’s Van de Ven, “for the next innovation, companies have to rely on people who are wet behind the ears, not on entrepreneurs who have tried this before.” And managers often fail to reward risk and punish or ignore failure. Discouraged champions then exit for other jobs in the company or leave the company altogether.

Some research employees at Hoechst Celanese have turned down invitations to champion their ideas in the first place, noting that the career ladder within the company’s research or business units is clear and predictable, while the future for those participating in the new intrapreneurial teams is uncertain. If their projects fail, will they lose their jobs? If they go back to their old jobs, will they still be candidates for promotions? And if they can’t return to their old jobs, will the company find jobs for them elsewhere? What kind of jobs will those be, and with what kind of future?

Jason Malone, a Hoechst Celanese mechanical engineer who comanages a business team developing one of his ideas, professes contentment with the risks he has taken. “If I had stayed where I was, I could have obtained as many as three promotions, but that was the ceiling,” he says. “Now I’ve gained a lot of business experience and a lot more exposure within the company, and I think my opportunities for advancement are greater.” Nonetheless, when asked what advice he gives to Hoechst Celanese managers about improving the innovation program, he answers without

hesitation: “Give people job security.” He adds that he knows of other intrepeneurs who “have dragged out their projects because they didn’t know what would become of them when the project was done.”

Work on teams can also be stressful. Scott Elrod, a Xerox PARC researcher who declined to join the Liveboard team, worried not only about job security but also about the many hours of work and travel that a commitment to the project would have required, since

he was then a new father. Nor is a busy schedule the only source of stress. “You have to be the kind of person who is willing to take risks and can live with the emotional ups and downs of a project,” says Hoechst Celanese’s Malone. A team runs up against technical, manufacturing, and marketing problems every step of the way. Morale can easily deflate. Weeks can be spent in limbo while senior managers decide whether the team should try to surmount the hurdle or close up shop.

Carol Smith, who formerly served on three new-product teams and is now a marketing manager at Hoechst Celanese, reports that one of the teams she worked with began to realize that customers simply weren’t interested in the product. “Some of the technical people took it hard. They were enamored with the technology they had developed.” In fact, all three products developed by Smith’s teams failed. The frustration—and the ambition to learn new skills—drove her to look for a job elsewhere in the company.

### Walking a Fine Line

A fundamental that can seriously hamper a team’s effectiveness, says Joseph Marone, dean of the school of management at Rensselaer Polytechnic Institute and author of *Winning in High Technology Markets*, is a vague or misinformed impression of the parent organization’s business objectives. Innovations aren’t just ideas made flesh and hurled into the marketplace. To be successful, they must closely align with a company’s goals.

Some employees  
are reluctant to  
champion their ideas  
because the future  
of team members  
can be uncertain.





**I**nnovations  
aren't just ideas made  
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To be successful,  
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A company that doesn't know the details of the business matters surrounding a particular product will, from top to bottom, make bad decisions or squander resources in multiple ways.

Alignment isn't always easy to come by, since innovation employees and senior managers often live in separate worlds. But at Monsanto, members of the innovation program keep an eye on business goals from the start. Innovations begin life in discovery teams that identify ideas with potential. "We want to pick the right ideas to work on and knock the marginal ideas out of further consideration as soon as possible," explains Janet Holloway, manager of information systems for the new-products division. Senior managers review the recommended ideas and select those that best fit the division's business goals. Ideas receiving a thumbs-up become the responsibility of a project team led by the senior manager from the research area that made the discovery.

Similarly, before Xerox formed Group Communica-

tions, PARC researchers had to write a business plan for Liveboard and make a presentation to Xerox CEO Paul Allaire and other top managers. And at Nike, where ideas from new products may come from any number of sources—including marketers, researchers, retailers, athletes, and ordinary customers—research and marketing managers sift through proposals and forward lists of semi-finalists to senior managers, who then choose the products the company will pursue.

Still, the focus on appropriate businesses can cause companies to demand too much documentation of teams, some team members charge. At Hoechst Celanese, says Steven Nielsen, coleader of a project team, he and his fellow inventors spend an inordinate amount of time drawing up business plans, writing proposals for funding, making presentations, and writing memos. Thomas Wojcik, manager of innovation administration,

replies that there is some merit to such complaints. "We're overdoing the documentation requirements," he says. "It has become easier for managers overseeing projects to focus on the paperwork than on the ideas themselves."

Mistakes like these are to be expected as companies experiment with product-development teams. But while many problems still need resolving, innovation experts say they figure that the mechanics of teamwork will eventually be solved and that they are generally encouraged by what they see in companies such as Hoechst Celanese, Xerox, and Monsanto. The experts say that for good reasons—speeding up product development, lowering innovation costs, and improving quality—teams are fast becoming a fundamental way of organizing work. As Mayo of AT&T comments, in the past few years his company has been learning "to use teams more effectively" and now has begun to rely heavily on them. ■



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## Converting an Industry

*Government  
should help  
defense firms  
compete and then  
get out of the way.*



THE U.S. defense industry, aided by generous government support during the Cold War, was a powerful engine of technological growth. But those days are over. As the defense budget declines and defense companies attempt to downsize, diversify, and convert to commercial markets, government can react in several ways during the time of transition.

As a strong advocate of free-market efficiency, my general inclination in fostering most industries is to get government out of the way and let the strongest competitors survive. Thus the best way to assist struggling defense firms—or any firms—is to create a business climate that will allow them to compete. In my administration we have therefore sought to enact tax, regulatory, and fiscal policies that do not punish investment in high-tech, job-creating enterprises.

For example, we have established an Emerging Technology Fund to guarantee bank loans for companies with a promising technology but that lack the history of earnings required to obtain private financing. We also recently signed into law a tripling of the investment tax credit so that high-tech companies will find it less expensive to build

state-of-the-art facilities in Massachusetts. This tax credit complements another policy change designed to encourage innovation—our 10 to 15 percent research and development tax credit, the most generous in the nation. Finally, we have pushed for a phase-out of the capital gains tax, a policy change that would greatly benefit those high-technology industries, such as biotechnology, that have heavy capital requirements for R&D (see “Cultivating Industry the Free-Market Way,” page 68).

But I believe government has a special obligation to take a more active role regarding the defense industry because its condition results directly from government policy.

One way *not* to help is to defy market forces and attempt to have government prop up the defense firm. The usual reasoning behind such a policy is that keeping the company open will preclude expensive government assistance programs for unemployed workers and their affected communities. But if there is no longer a demand for a given company's products, government attempts to save it are simply postponing the irrevocable judgment of the free market. The company must either develop new

enterprises or go out of business.

Although some defense companies may be preserved intact, preferring to exclusively target the defense contracts that remain, the industry should be regarded as a valuable collection of resources—including technology, skilled labor, and a manufacturing base—that must be directed away from shrinking defense markets.

Some firms may want to convert to commercial markets, perhaps buying other firms to gain needed expertise, and new companies will emerge from among the traditional contractors, perhaps started up by laid-off engineers. While this period of readjustment is bound to be painful, the faster the shake-out occurs, the better off the industry will be.

Government can speed this process of readjustment. In particular, I believe that government support of technology development—leading to the creation of new products, the driving force behind economic growth—can reap the greatest reward per dollar invested.

For example, government can provide modest assistance to defense firms applying their high-tech talents to developing commercial products. The federal government has begun doing this



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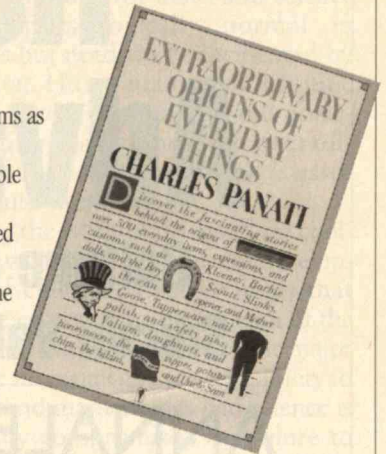
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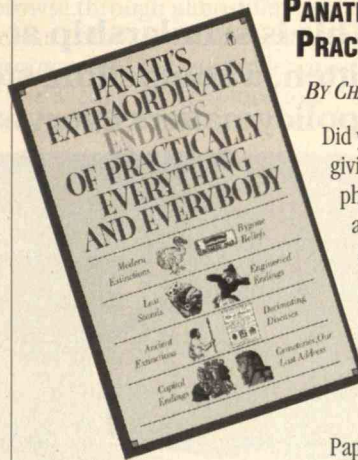
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through the Technology Reinvestment Project (TRP), a \$471 million program designed to help companies shift the focus of their activities and resources. My state began the Massachusetts Technology Development Partnering Program to help local companies become better contenders in this federal competition. A local firm seeking a TRP grant can first apply for funds from the state program, thus giving it Massachusetts' financial partnership and imprimatur.

The state also recently provided \$2 million in seed money, and was subsequently awarded a \$10.6 million federal grant, to begin the Massachusetts Modernization Partnership. This initiative will give small manufacturers access to information about the latest and most efficient manufacturing techniques and business practices. Networks of related firms, established with state assistance, as well as industry-driven but state-supported extension agents, will play critical roles in disseminating information.

We have initiated a similar program to give former defense employees some of the high-tech skills needed in commercially oriented work. The Worker Dislocation Program, sponsored by the Massachusetts Job Council, retrains workers for jobs in state industries that are in good health, such as software and telecommunications, or that have excellent future prospects.

Our state's defense-adjustment policy, in other words, is designed to create a favorable environment for investment in general and to reduce the costs of developing new commercial technologies and products in particular. And while we will make the resources of the state available for companies to improve their business and manufacturing practices, we firmly believe that only private companies and individuals can find ways to compete, create jobs, and grow. Such government policies not only mitigate the effects of defense cuts but also provide the basis for long-term economic strength. ■

WILLIAM F. WELD, a Republican, is governor of Massachusetts.

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Silicon Valley in California and Route 128 in Massachusetts are America's leading centers of electronics innovation and entrepreneurship. The regions are similar in many respects: both trace their origins to university research and military spending and both faced severe downturns in the early 1980s. Today, however, Silicon Valley is again flourishing while Route 128 continues to decline.

What accounts for this difference in fortunes? Why did Silicon Valley adapt successfully to intensifying international competition, while Route 128 ceded its longstanding advantage in computer design and manufacturing to the west? AnnaLee Saxenian argues that despite similar histories and technologies, Silicon Valley developed a decentralized industrial system that encourages experimentation, collaboration, and collective learning among networks of specialist companies, while Route 128 came to be dominated by a few self-sufficient corporations.

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## Odysseus in Cyberspace

LIKE most people, I'm excited about the prospect that lies before us in the age of the information highway. I'm thrilled by the thought of being able to search through the world's libraries while sitting at my desk at home. I'm delighted with the possibility of ordering up the movie of my choice, the music I'm in the mood for, the sights and sounds of faraway places. Although I don't use electronic mail or participate in conversations among thousands of strangers on computer networks, on the whole these developments seem benign, perhaps even good for democracy. And of course, as an engineer, I'm proud of how my profession has brought such marvels to a world much in need of practical help—to say nothing of a psychic lift.

Yet along with these pleasant thoughts I have feelings of apprehension. These stem from the feverish writings I've encountered describing a mystical realm called cyberspace. Apparently, one "enters" this vast cosmos, moving through computer-screen windows, and then "explores," following one's fancy. Call up the text of *Moby Dick*, then summon the sight and sound of the ocean, research the life of Herman Melville or the anatomy of whales, see Gregory Peck in the movie and freeze a few frames for later use—this is the sort of thing that awaits us in the new enchanted galaxy. According to Steven Levy, author of a recent book about the Macintosh computer, millions of people already "make the excursion" daily. In the future, he predicts, "we will cross the line between substance and cyberspace with increasing regularity."

The ability to follow one's every impulse or fleeting idea, wherever it may lead, probably helps nourish creativity. But as I contemplate this new form of intellectual space travel, I am struck with a case of vertigo. I fear that we may be undercutting the mental processes upon which good engineering depends. Caprice and inspiration are important. But so is the ability to assess experimental evidence, comprehend mathematical verities, and refute false appeals to intu-

ition. Technical work requires discipline, concentration, and restraint. We should be cautious about losing these traits among the whirling universes of infinite choice.

Hardly anyone I know shares my sense of uneasiness, least of all the engineers and educators who should be most concerned. Optimistic delight seems to be the prevailing sentiment. In the words of a professor of learning research at MIT, children will steer a "knowledge machine" to any topic of interest, "quickly navigating through a knowledge space much broader than the contents of any printed encyclopedia." It will be fun, I do not doubt, to sit in front of my workstation of the future and browse through almost limitless hypermedia databases. And for students, the promises of "self-guided learning" and "knowledge by exploration" sound wonderful.

thinking needed for math and science is not physiologically normal in humans but needs to be inculcated by education. He maintains that scientific thinking, which is analytic and objective, "goes against the grain of traditional human thinking, which is associative and subjective."

Citing the work of the Swiss psychologist Jean Piaget on the mental development of children, Cromer notes that infantile egocentrism—confusion of the self with the outside world—is the major obstacle to mental growth. The ability to understand mathematics and science is especially compromised by failure to overcome "the innate human tendency to confuse thought and reality." I fear that flights through cyberspace, however energizing they may be for the imagination, may weaken the objective rationality needed to do good engineering. The danger is greatest for children—the



Yet we cannot constructively spend a major portion of our time operating under the spell of serendipity or free association, or even purposely flitting from one interest to another. The most useful thing I remember learning in school was how to prepare an outline; how to organize my thoughts; how to focus. The amount of available information is enormous, the day is short, and we are, after all, human. An individual can read only about 360 words a minute, speak 150, hear and comprehend 250, and type 60.

In his book *Uncommon Sense: The Heretical Nature of Science*, physicist Alan Cromer argues that the formal

potential engineers of tomorrow. But none of us is safe.

I don't know what we can do to guard against the allure of cyberspace except to caution others—and ourselves—about the dangers that exist in that mysterious vastness. Perhaps we might start by floating an icon on our computer screens: Odysseus tied to the mast so that he could hear the song of the sirens but not be diverted from his journey. ■

SAMUEL C. FLORMAN, a civil engineer, is the author of *Engineering and the Liberal Arts*, *The Existential Pleasures of Engineering*, *Blaming Technology*, and *The Civilized Engineer*.



# Are Industrial Clusters Losing Their Luster?

CONVENTIONAL wisdom about the “lean production” system used to manufacture cars has rested on some core certainties. One holds that to foster collaboration and just-in-time parts deliveries, automakers and their key suppliers cluster into tightly packed industrial districts, thus forming a strong economic home base for regions and nations. This verity—pioneered by Toyota in Japan and pursued with a vengeance by the German automobile industry—is now under attack.

Just look at what is happening in Germany. One of the world’s most famous clusters of manufacturers, suppliers, and customers lies in the southwestern German state of Baden-Württemberg. The area around the city of Stuttgart is home to Daimler-Benz and its most sophisticated systems supplier, Robert Bosch Co. Another complex has grown up over the years around BMW’s facility in Regensburg. To a lesser extent, Volkswagen and Ford have also developed concentrated production networks in Germany. The nurturing of an industrial home base has contributed greatly to these companies’ technical superiority. (The success of Ford Motor’s German operations comes at least in part through Ford’s decision to locate within the German auto industry’s technologically superior home base.)

But over the last several years, these clusters have started to unravel, according to economic geographers and car company executives I had the opportunity to interview recently. The companies are relying more on foreign partners, shifting to foreign sources, and building new overseas plants. One reason is that the circumstances that have fostered centralized production are changing. The modern model of automobile-manufacturing industrial districts stemmed from postwar Japan, whose railroads and highways were a shambles. But Europe’s highly developed freight-transportation infrastructure allows German suppliers to make just-in-time deliveries without having to locate in their customers’ back yards.

Not only is there less need to concen-

trate production spatially, but changes in the global economy are creating incentives to move operations elsewhere. The past five years have seen sophisticated production facilities emerge on the European periphery and within the Third World. Countries such as Mexico, Brazil, and China—formerly known for their cheap, unskilled work forces—have suddenly appeared on the radar screens of German corporate planners by offering large pools of highly skilled labor at unit costs (wages, adjusted for productivity) far lower than at home. This difference is enhanced by the high pay and ample benefits that the German auto industry negotiated over the past years with the metalworkers’ union.

The country’s macroeconomic policy is exacerbating this already serious problem. German suppliers and skilled workers have become even costlier to the car companies because of the intentionally



high value of the country’s currency and high interest rates. These policies stem from the German central bank’s resolve not to allow public expenditures on reunification with East Germany to drive up inflation. The result—since it will probably take a long time to integrate the economies of eastern and western Germany—is a powerful incentive for German automakers to move at least some car production out of the country. And customers are pressuring those operations that remain in Germany to engage in unprecedented price competition.

And yet there is a paradox. Many of the same German and Japanese companies that have moved some of their oper-

ations abroad are trying to recreate in those host countries—including the United States—the very same clusters of suppliers, research and training institutes, and pools of specialized workers that they had previously supported at home. The “transplant” auto-industry concentrations now appearing in the midwestern and southeastern United States are not as tightly packed together as Toyota City or Stuttgart, but that’s only because our good highways and freight rail systems permit just-in-time delivery from a distance. Although spread out over a wider area, these transplant complexes nevertheless attempt to mimic the clusters that contributed so much to the productivity of these firms at home.

The lesson for U.S. industrial policy is that there are, after all, certain best practices of organizing production—practices that superior global companies continually seek to re-create, wherever they

may be located. Even under the intense pressures of heightened international competition, the politics of German reunification, and the financial crisis in Japan, the advantages of strategies such as geographic clustering and nurturing key suppliers continue to appeal to world-class managers in the big car companies. Taking note of, and promoting, such practices should be a high priority for the Clinton administration. ■

*BENNETT HARRISON teaches at Carnegie Mellon University and is the author of *Lean and Mean: The Changing Landscape of Corporate Power in the Age of Flexibility*, published this month by Basic Books.*



# Reviews

## BOOKS

### CULTIVATING INDUSTRY THE PRAGMATIC WAY

*Mastering a New Role:*

*Shaping Technology Policy for National  
Economic Performance*

by the Committee on Technology Policy  
Options in a Global Economy

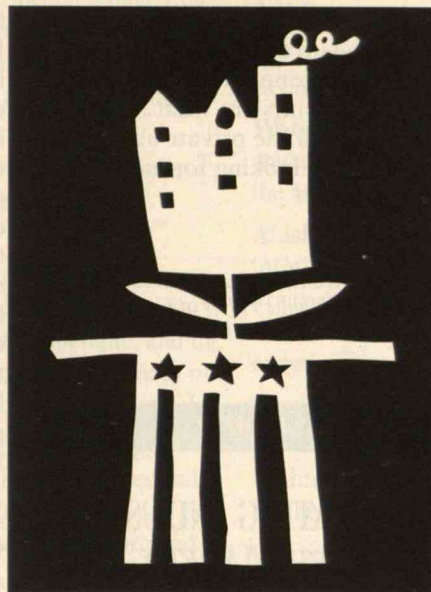
(Harvey Brooks and John S. Foster, Jr., cochairs)  
National Academy of Engineering  
National Academy Press, \$22.95

BY RONALD FRASER

**M**INDFUL that Americans are far more reluctant than their European and Asian competitors to reshape public institutions for the purpose of stimulating economic growth, *Mastering a New Role* makes the case that the time has come to do just that. The most curious aspect of this National Academy of Engineering report, however, is the prescription for reaching that end. As we approach the twenty-first century, reviving America's technology-dependent economy will, according to the authors, require a massive dose of old-fashioned nineteenth-century American pragmatism.

During the 1970s and 1980s, our traditional reliance on the free market to overcome economic challenges was amplified by a mood, shared across the political spectrum, that big government was the problem, not the solution. Public and private leaders called for privatizing public services and shifting public responsibilities from the federal to state and local levels. This mood perpetuated a fragmented public policy response to our emerging economic dilemma, and postponed for at least a decade serious attempts to develop more effective government institutions.

All the while American firms continued to lose ground. Stiff competition from overseas companies—many using



production and management practices developed with government help—captured large shares of the world's market. Between 1980 and 1990, the academy reports, the U.S. share of world high-tech manufacturing slipped from 40 to 36 percent, while the Japanese share grew from 18 to 27 percent.

After identifying the key U.S. shortcomings that underlie this economic slippage, *Mastering a New Role* outlines four national goals that, if satisfied, will presumably reestablish American economic leadership in the global arena:

■ *Speeding the adoption of commercial technologies throughout the U.S. economy.* To this end, the academy calls on state-level technology extension programs to help modernize management practices in our small and midsized manufacturing firms, aiming to reach 20 to 25 percent of all such companies by the year 2000. The report also urges state and local governments to find better ways to help firms retrain older workers in response to the demands of new technologies, and to ease the school-to-work transition for younger people.

■ *Boosting investment in civilian R&D.* This can be accomplished with a permanent R&D tax credit, creative public procurement and regulatory policies, and federal sponsorship of consortia to

develop technologies that will benefit entire industrial sectors.

■ *Exploiting overseas technologies and markets.* To move beyond our not-invented-here mentality, the academy recommends federally backed R&D consortia for searching out and adapting the best foreign-developed technologies. Access to foreign markets can be improved through more constructive and far-reaching international agreements, through arbitration mechanisms, and through actions aimed at reducing market asymmetries by promoting mutual benefits.

■ *Integrating federal economic and technology policymaking institutions.* A key step toward leveling the international playing field, says the report, is to devise a single, coherent national strategy for economic and technological development. Such a strategy will require greater cooperation among bureaus, which could be brought about by rotating government executives among federal agencies and forming interagency committees and councils.

On the face of it, the academy's strategy seems curiously limp given the dire crisis it must address. The four-point strategy rests largely on a survey of familiar ideas and on a search for solutions instead of on the presentation of solutions themselves. Some might wonder whether a lingering suspicion of government is holding the authors back. Others might blame the trusty committee structure for the report's mild tone; committees, after all, are notoriously dependable devices for reining in even the most volatile topics.

Yet it is important to realize that the academy's experts are muddling through these uncharted global waters alongside the rest of us. The real purpose of *Mastering a New Role* seems to be to set in motion a serious search for yet-to-be-discovered answers.

#### A Policy Laboratory

In this regard, the report has its feet squarely planted in the home-grown, all-American philosophy of pragmatism.



Pioneered in the last century by physicist and logician Charles Sanders Peirce, philosopher-psychologist William James, and philosopher-educator John Dewey, pragmatism rejects dogma as a trustworthy guide for collective action. Instead, the preferred method of action is open-mindedness and systematic experimentation leading to informed choices in real-life laboratories. As one contemporary philosopher, Richard Rorty, puts it, Dewey's central argument was that "you only know what you want after you've seen the results of your attempts to get what you once thought you wanted."

In *Mastering a New Role*, trial and error is the vehicle for sorting out new public policies that work—that actually help private firms compete in the global economy—from those that do not. Our responses to declining economic performance have been "ad hoc and narrow," the committee members write. "Stronger measures are required. What and how strong these should be is a matter of judgment and cannot be determined without more aggressive experimentation and learning on the part of both public and private sector players." No matter what policies the federal government tries, it must mount "stronger efforts to develop measures of their effectiveness." Although the report never refers directly to American pragmatism, John Dewey could not have said it better.

To the extent that technology policy gridlock in the 1980s was the result of ideological name-calling between advocates of the free market and those claiming the government can pick winners, *Mastering a New Role*, if embraced by public and private policy leaders, would radically change how policy is made in the future. The report's central message is: We still don't know what government's role should be, but we think it's time to find out.

One reason the academy's pragmatic approach might catch on in the 1990s is its potential appeal to no-nonsense American businesspeople. It is really a "bottom-line" philosophy, one that

stresses results, not blind attachment to a particular belief system. And judging from the tone set by *Mastering a New Role*, results are what American leaders in both the private and public sectors will be looking for in the years ahead. ■

RONALD FRASER is a doctoral candidate in the Institute of Public Policy at George Mason University. He lives in Burke, Virginia.

## BOOKS

## CULTIVATING INDUSTRY THE FREE-MARKET WAY

*Technology Policy and America's Future*

by Steven M. Irwin

St. Martin's Press, \$39.95

BY BRUCE D. BERKOWITZ

THE Bush administration had little to say about promoting technology to spur the economy besides insisting that government had no business choosing technological winners and losers. The Clinton administration, however, has said plenty. Although Clinton's technology policy breaks with traditional Democratic party thinking in several important respects—it rejects creating new state-run bureaucracies, for example, and favors government-industry partnerships—it contains two enduring Democratic ingredients: government money and centralized planning.

Popular concern over the budget deficit makes more federal spending on research and development out of the question, so the administration proposes shifting funds from defense R&D to programs with commercial applications. The administration also wants 20 percent of defense R&D itself to have civilian spinoffs.

On the planning front, the adminis-

tration does not hesitate to establish R&D priorities. For example, in the recent Technology Reinvestment Project, a program aimed at helping defense industries move into the civilian sector, the request for proposals listed scores of research topics—such as ceramic jet engine components—considered critical to high-tech economic growth. The government did not require applicants to fit their proposals into one of the specified topics (in fact, it issued an amendment to the solicitation saying just the opposite), but anyone familiar with government procurements ought to be able to read between the lines.

Now, as Clinton's programs pick up steam, Steven M. Irwin has provided what the Bush administration would not: a serious critique of centralized technology planning and the rationale for a more market-oriented approach. Irwin, a research associate at the Henry L. Stimson Center (a public policy research institute in Washington, D.C.), demonstrates that it is difficult to target specific technologies to promote the economy, and that the connection between targeted technology and economic growth is tenuous at best. He also points out that any program allowing the selection of "favored" technologies is bound to bog down in pork barrel politics. Therefore, Irwin concludes, we need to design a program for technology development that is tailored to the realities of the market (especially the free-wheeling American economic system), and robust enough to resist the political shenanigans that inevitably occur in a democracy.

Irwin begins *Technology Policy and America's Future* by reviewing the usual statistics that worry economists and government officials: other countries invest less R&D money in defense and more in commercial products, U.S. exports of technology-intensive products are slipping, overall R&D spending by industry is down, and so on. To put these fear factors into perspective, he notes that the relative gains made by other countries largely reflect how much ground these countries had to make up after



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World War II. Now that they, too, have become modern, technology-intensive economies, their growth rates have begun to taper off.

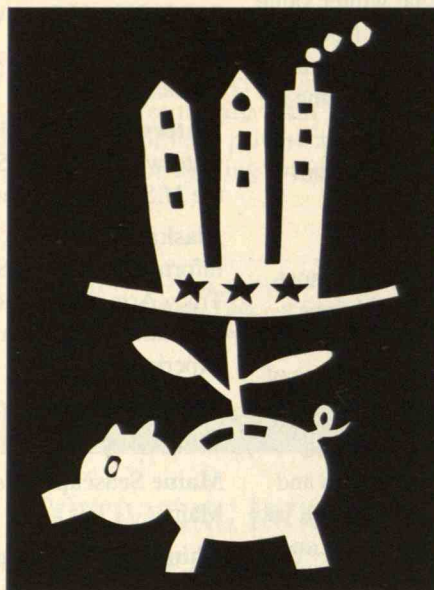
Irwin also notes that, despite the administration's apparent assumption that high-tech jobs are high-quality jobs, the connection between the two is loose or nonexistent. High-quality jobs are usually associated with good pay; "lawyer," "public relations specialist," and "vice-president of the United States" come to mind, but none of these depends much on advanced technology. High-quality jobs are also supposed to offer reasonable security, yet as anyone who worked in the semiconductor industry in the late 1980s or in the aerospace industry in the 1990s can attest, such high-tech jobs are often the most precarious.

Besides, writes Irwin, it is hard to target R&D funding programs so that they benefit only U.S. companies. He takes the classical justification for government-sponsored research—that firms invest too little in R&D on their own, for fear that competitors will profit from their hard work—and turns it to his own purpose. When it comes to information, says Irwin, nations are even more porous than companies: the results of a federally funded technology program will likely be bought, stolen, or simply observed by foreign companies, which will apply them to their own products.

Indeed, in an era of multinational corporations, it is often difficult to say what a "U.S. company" is. Even companies that are U.S.-owned today could be foreign-owned tomorrow if they are publicly traded. And, of course, once a product is developed, there is little to prevent a company from manufacturing it offshore. Thus, federal funding programs may end up pouring resources into a leaky bucket.

### Adjusting the Climate

None of this is to say that Irwin is not concerned with technology development or the national economy. He agrees that over the long term noth-



ing affects a nation's economy as much as growth in productivity. He simply does not have much confidence that the current plan of direct assistance to selected parties to develop so-called critical technologies will achieve this goal.

Rather than subsidize R&D, Irwin would focus on the actual reasons U.S. industry fails to develop or apply technologies essential to long-term growth. For instance, he would relax the anti-trust laws that prevent companies from expanding to an efficient size at which they can afford to carry out R&D and translate it into products. And he would eliminate arcane procurement requirements that leave government contractors so ill suited to competing in commercial markets that they cannot apply the results of federally funded R&D.

Irwin also worries about market factors that discourage U.S. companies from carrying out and exploiting R&D effectively. This issue boils down to money: the up-front costs of research, and of the plant and personnel necessary for production. Here, Irwin and the administration agree on the problem but disagree on the solution. While Clinton wants to inject government money and offer subsi-

dies so that industry will inject some of its own, Irwin would ensure an adequate supply of capital through incentives such as lower taxes, predictable fiscal policies, and low interest rates (see "Converting an Industry," page 62).

More and more studies of technology-based development—most recently James Fallows's examination of Japanese industries in *Looking at the Sun*—conclude that success depends less on prescient planning than on the simple abundance of capital. In short, companies need lots of money to experiment with different ideas and to survive the hard times that plague any new industry. There are many ways to achieve this abundance. The Japanese do it by encouraging savings. The Soviets did it by confiscation. To the extent that the United States has done it, the mechanism has been a combination of government-supported R&D (especially for defense) and the basic strength of the U.S. economy.

If money really is the solution, Irwin's recommendations answer the mail better than the administration's policy. The American public today will never allow the federal budget to grow enough to permit a significant rise in R&D funding. At best, the new programs Clinton proposes will be a high-profile drop in the bucket.

Ironically, George Bush may have been on the right track: getting government out of the way and providing the right incentives to let markets work could promote technology at least as well as any government program. Unlike the Bush administration, however, Irwin explains why. Bush could have used these arguments in 1992—or, even better, in 1990, when the economy went south. Anyone running against the current technology policy in 1996 would do well to have this book at hand. ■

BRUCE D. BERKOWITZ, an adjunct professor in the Department of Engineering and Public Policy at Carnegie Mellon University, consults and writes on technology development.



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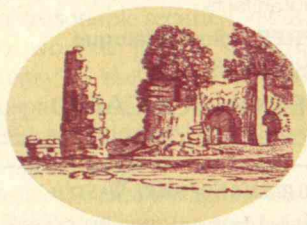


# Phenomena

By DAVID BRITTAN

## THE MISMEASURE OF TIME

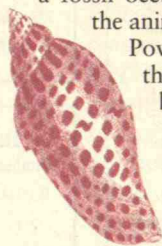
When Harvard archeologist Fredrik Hiebert examined ancient temple sites in the former Soviet republic of Turkmenistan, two things quickly became apparent: one of the world's minor religions may be hundreds of years older than previously thought, and Russian archeological dating methods are not all they could be. Viktor Sarianidi, the Russian archeologist who unearthed the desert ruins in the 1970s, believed the temples dated from



around 1200 B.C. They contained artifacts—including twigs of ephedra, a hallucinogen—associated with Zoroastrianism, an eastern religion commonly believed to have arisen in Central Asia between 1200 and 600 B.C. Stylistic similarities to Mesopotamian artifacts appeared to place the temples at around the earlier date. Enter Hiebert, armed with the latest in Western carbon-dating techniques. “We kept getting dates of about 1800 B.C.,” says Hiebert. Does carbon dating provide the final word? “Absolutely.” Sarianidi shuns the technique because, as practiced in Russia, it has proved unreliable. “The Iron Curtain between Soviet and Western science caused these two scientific worlds to develop separately,” Hiebert explains. Russian carbon dating, he says, fails to account for variations over time in the amount of carbon-14 in the atmosphere. This radioactive form of carbon is absorbed by all living things, and, as it decays, provides a record of how long ago an organic material ceased to “breathe.” U.S.

archeologists have painstakingly analyzed the growth rings of ancient trees to determine the atmospheric concentration of carbon-14 in any given year, and can now correct their carbon readings accordingly. Russian dating, in contrast, is often 500 years off. As the barriers between Western and Russian archeology fall, Hiebert hopes to make converts of his Russian colleagues. “One has to be very diplomatic about this,” he says, “but slowly they’re going to learn from us.”

**WHAT MAKES A FOSSIL?** Eric Powell, an oceanographer at Texas A&M University, is also anxious to build an accurate picture of the past. Specifically, he wants to know how nature decides which sea organisms will be preserved in ocean sediments and which will be obliterated. The answer, he believes, will help scientists interpret the world's fossil record, which is often misleading. Species that have been fossilized in large numbers may not have been more abundant than other species, just better preserved. To catch nature in the act, Powell and a team of researchers from several other institutions have placed bags filled with wood, sea urchins, and a variety of shells on the ocean floor in the Caribbean and the Gulf of Mexico. Their aim is to test the rate at which specimens deteriorate in different environments—highly saline, carbonate, and petroleum-rich, for example. “We believe that a large fraction of what happens to a fossil occurs soon after the animal dies,” says Powell. “If something is going to be preserved at all, the first 1 to 50 years is crucial.” The team plans to check up on the would-be fossils in 1, 3, 5, and 10 years.



on the would-be fossils in 1, 3, 5, and 10 years.

## THE SOUND OF HEAT

While some are driven to probe across time, others are content to probe across walls. Fire detection researchers at the National Institute of Standards and Technology have developed an acoustic sensor that listens for the telltale ultrasonic waves that heated materials emit as they expand. The sensor can detect small fires or overheated wiring behind walls and ceilings from 10 feet away, and can spot such hazards much faster than standard smoke or heat detectors, according to William Grosshandler, leader of the institute's Fire Sensing and Extinguishment Group. The detector's signal processing still needs fine tuning: construction work or heavy equipment being rolled around can trigger false alarms, says Grosshandler. But once refined, acoustic fire detection could lead to safer buildings, tunnels, and underground cables.

## AS FAR AS THE EAR CAN SEE

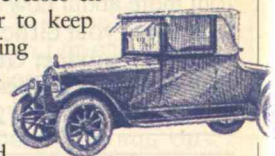
People who are blind and don't mind wearing a compass on their head may also benefit from current research in acoustics. A “virtual acoustic display” designed at the University of California at Santa Barbara could enable the blind to find their way around a strange city by listening to computer-generated cues through headphones. Such an audio landscape might take any number of different forms, says Jack M. Loomis, a professor of psychology at UCSB who has designed a prototype system with colleagues at Santa Barbara and at Carnegie Mellon University. “In one mode,” says Loomis, “the five nearest landmarks would seemingly call out their names to you.” Or the user might type a destination on a keyboard and follow a tone whose apparent direction would change when it

is time to turn a corner. The trick is getting accurate environmental input. The prototype—with its electronics carried in a backpack—tracks the user's whereabouts with signals from navigation satellites, which in cities are often obscured by buildings. And each landmark in a given area must be laboriously entered into a database. But Loomis expects these obstacles to shrink as more companies enter the field of personal navigation for vehicles and sighted pedestrians.

## ROUND THE BEND

For the past two years, Penelope Falsch, an anthropologist from Oxford University, has studied the driving habits of Peru's Texacoatl Indians. Why, she wanted to know, do they experience less car trouble than any other indigenous group in the Americas? “The way they charge up those bumpy Andean roads, I knew they weren't exactly babying their cars,” says Falsch. Her conclusion: the Texacoatl cut scarce gasoline and oil with *guazcál*, a traditional medicine derived from the *guazcáhol* plant. “*Guazcál* seems to enhance a vehicle's ability to repair itself,” says Falsch. “Through some unknown mechanism, it actually reverses engine wear to keep cars running like new.”

One 1949 Packard I examined needed body work but was in mint condition under the hood.” A GM spokesperson is skeptical, but admits: “Nobody fully understands how the modern automobile works. We've long suspected that some kind of natural healing process goes on in cars. For example, one day you hear a rattle, the next day you don't.” Falsch will present her findings at a London conference that is scheduled, perhaps not accidentally, for April 1.





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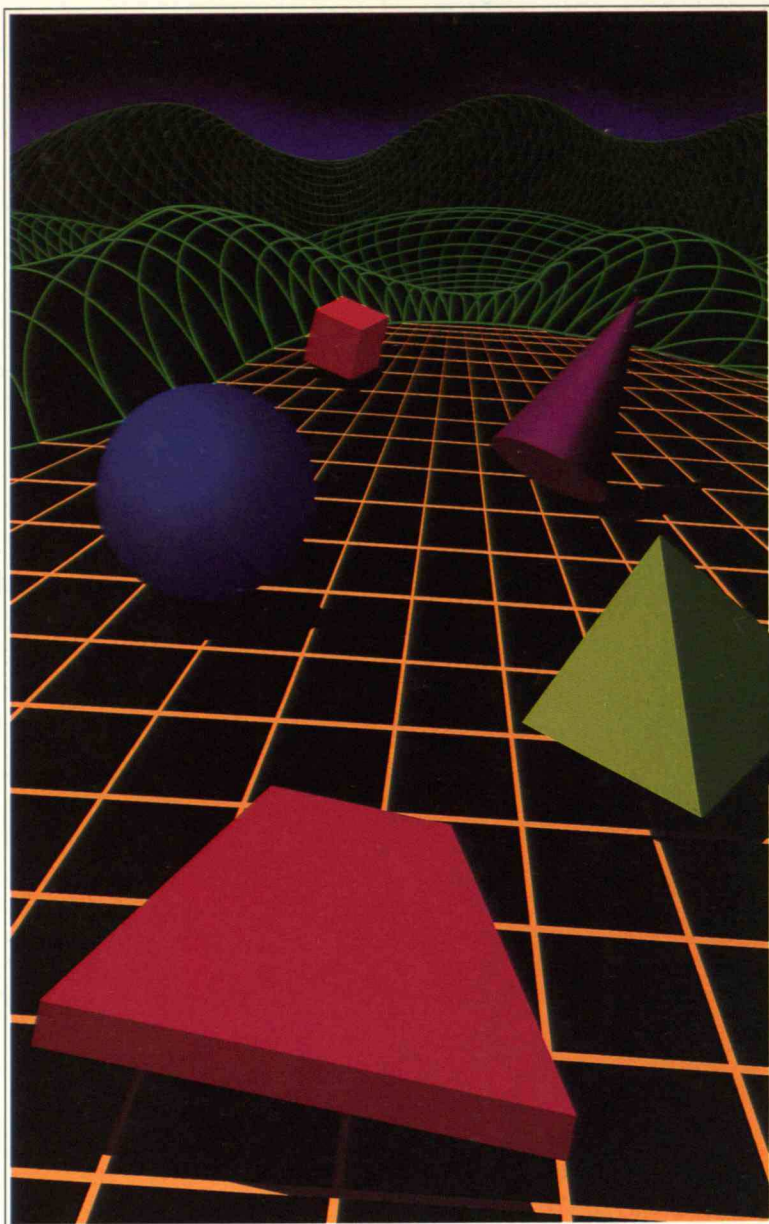
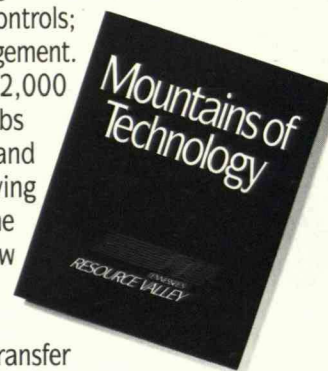
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